Feedlot Management

MANITOBA

FEEDLOT MANAGEMENT

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Introduction

The aim of every cattleman who finishes his own calves should be to produce large, healthy, uniform calves ready to go into the feedlot at weaning and to be finished as quickly as possible at the least cost.

To achieve this, care and planning must go into the breeding of the cow herd. This involves:

- Maintaining the cow herd in a healthy condition at all times and meeting the herd's nutrient requirements during maintenance, pregnancy and lactation.
- Selecting sires from performance tested animals with strong consideration given to the potential sire's birth weight and weight per day of age at one year.
- Using crossbred dams to increase fertility and weaning weight.
- Using sires of European breeds such as Charolais, Limousin, Maine Anjou and Simmental for large framed, heavier calves.
- Shortening the breeding season to 45 days so the calf crop is more uniform in size.
- Calving early to produce heavier calves at weaning.
- Aiming for steer calves with weaning weights of 370 kg (600 lbs) or better and heifers from 245 kg (540 lbs).

Once a producer decides to finish his own calves several options are open to him. He can set up a feedlot and feed his own cattle, and much of this publication is dedicated to producers who choose this option.

Or he can pay someone to finish his calves for him in a custom feedlot.

Custom feedlots offer several benefits to novice feeders. First, they eliminate the need for a capital investment in corrals, mixers and equipment to feed and handle the cattle. They also supply the time and labor to look after the cattle. Finally, most custom lots provide the most valuable commodity of all, experience. Most custom operators are experienced in feeding young newly weaned calves right through to slaughter, and in judging exactly when those cattle have produced enough finish to grade well when marketed.

A third option is to finish cattle in a co-operative feedlot. This option may appeal to producers who want to feed their own cattle but lack the necessary experience and funds to handle a feedlot operation on their own.

A co-operative group can be composed of any number of producers. Very small or very large groups are eligible for incorporation as a co-operative in Manitoba.

The members share in the management, control and operation of the facilities which can be owned, rented or a combination of both. Each member, however, would retain the ownership of his/her cattle.

Small co-operative feedlots offer several advantages:

- The feedlot is generally located close to all members, reducing the cost and stress in trucking.
- Trucking fees and sales commissions are reduced as cattle are sold in larger lots.
- There is less exposure to disease, since only a limited number of herds are involved and, in most cases, the health status of these herds will be known to the other members.
- Feed supplies can be grown close to the lot by the members.
- With several farms to choose from it should be easier to find an ideal site for the lot.
- Experience and labor can be shared by several farmers.
- The capital and operating cost for each member is much lower than if they operated their own feedlots.

More information on co-operative feedlots is available from the Department of Co-operative Development, 900-405 Broadway Ave., Winnipeg, R3B 3L6.

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Feedlot Facilities

Most Manitoba beef cattle are finished in open lots, which are usually protected by trees or windbreak fences from cold winter winds. The resting area for the cattle may be on high ground in the pen or in an open front loose housing barn. Most lots are unpaved except possibly for a strip of concrete along the feed bunks and around the waterers.

A few cattle finishing operations in the province use paved lots, feeding barns, and cold or warm confinement barns. Such facilities are not considered in this publication but assistance in planning them is available from Manitoba Agriculture staff.

Feedlot Components

In designing the layout for open farm feedlots, the following items should be considered:

Feeding Pens: Two or more pens are needed to allow grouping according to weight, sex and feeding program, and to make handling the cattle easier. Even in large feedlots the pens should have a maximum capacity of 150 head. Sheds are optional for cattle on full feed. At a minimum each pen requires:

- shelter and drainage
- access for feed and cattle
- feeding and watering facilities

Hospital Pens: These are required in larger feedlots and should be sufficiently large to hold 2% to 5% of the total feedlot capacity. Hospital pens should be isolated from feeding pens and should have a concrete floor as well as removable feedbunks, water pails and troughs for easy cleaning. Headgates, squeezes and chutes are also required to hold animals securely for veterinary treatment.

Handling Corral: This corral should include a sorting alley 4 m (13 ft) wide, sorting and holding pens, a scale, a loading chute and a working chute with squeeze and/or headgate. A shed should be placed over the working chute so cattle can be handled in all kinds of weather.

Feed Handling: A feedlot feeding system involves storage facilities for grain, supplement, and roughage; equipment for grinding and mixing rations; conveyors, augers or other equipment to move ingredients around; and equipment for delivering feed to the pens.

Waste Management: This may involve dykes and/or ditches to prevent clean surface runoff water from flowing into the feedlot; sloped pens and, if necessary, ditches and/or dykes to collect feedlot runoff; retention ponds to hold feedlot runoff; and manure handling equipment.

Management: An office is generally required in large feedlots. Other facilities that are needed to manage the lot are: a fence around the entire feedlot to hold cattle that escape from pens or alleys, windbreaks and snow fences where required, snow removal equipment, plus equipment storage and maintenance facilities.

Choosing The Site

Water

The first thing to look for when choosing a feedlot site is an adequate water supply. A feedlot should never be constructed at a site where there is any doubt about the quantity or quality of the water to meet present or future needs.

As a guideline, feedlots require 35 L of water (8 gal) per head per day and a maximum of 70 L (15 gal) per head per day during extremely hot days. Some insurance against power or pump failure can be provided by having a stand-by generator available, and installing two interconnecting pumps in the system. The water system should also include a stand-by water tank in the feedlot, and large water bowls.

A sample of the water from the proposed source should be analyzed for quality before the feedlot is constructed. Samples can be submitted for analysis through the local public health inspector or your agricultural representative.

The effects of water quality on livestock are not very well known, however, there are some guidelines available on the tolerance of cattle to certain impurities.

A limit of 10 000 mg/L (10,000 ppm) of dissolved solids is suggested. However, this figure is somewhat variable depending on the kinds of salts present, the diet, age, and health of the cattle, and the season of the year. Even mineral contents considerably below this limit may make the water taste so bad that cattle will not drink enough. It may also have a laxative effect. In either case, the cattle will not gain as they should. Thus, poor quality water will make the feeding of cattle unprofitable.

Impurities also can adversely affect the cattle's water supply. For example, cattle of any age can be affected by nitrates. They can, however, tolerate concentrations of 100 mg/L (100 ppm) in their water, 10 times the limit for humans, provided the feed is not also unusually high in nitrates.

Suggested threshold limits of some other impurities are:

Sulfates 1000 mg/L (1,000 ppm)
Sodium 2000 mg/L (2,000 ppm)
Chlorides 3000 mg/L (3,000 ppm)
Calcium 1000 mg/L (1,000 ppm)

A qualified nutritionist should be consulted before a cattle feeding enterprise based on a water supply of doubtful quality is established.

Under certain weather conditions some strains of blue-green algae produce a toxin that is lethal to cattle. Deaths occur when cattle drink from lakes, sloughs, or dugouts in hot weather when there is a high concentration of blue-green algae in bloom. The growth of algae can be controlled in small bodies of surface water by adding copper sulfate (bluestone) at a rate of 1 g/m^3 (1 ppm) evenly through the water and repeating the application every 3 weeks during July and August.

Water pumped into elevated watering bowls or troughs cannot become contaminated by manure.

A pond, slough, or dugout that is contaminated by manure may contain parasites and bacteria which are potentially dangerous to livestock. Therefore, these sources should be fenced and the water pumped to elevated drinking troughs or watering bowls in the lot which cannot be contaminated.

Drainage

The rate of gain and feed efficiency of feedlot cattle are adversely affected by muddy pens. A south-facing slope is ideal for feedlots because it allows the sun to warm and dry the pens. It is possible to provide adequate drainage in other directions but considerable earth-moving may be required. Ordinarily, in unpaved lots the slope of lots should be at least 1:25 (1 m of fall for every 25 m of run or 4%). The lot should be graded to insure that water drains away from feeding, watering, and resting areas into an alley or away from the feedlot. In flat areas it may be necessary to build mounds in order to get adequate drainage in the pens. The earthen mounds should be a minimum of 1.5 m (5 ft.) high with side slopes between 1:5 and 1:4 (20% to 25%). Where drainage flows into an alley, the alley should be hard surfaced and sloped so that the water can flow away from the feedlot. Internal drainage through the soil cannot be depended upon, even in light-textured soils, since accumulating manure combined with soil compaction by the cattle tends to seal off the surface.

Shelter

Natural shelter should be considered in selecting a site and used to advantage whenever it is available. When trees are used for shelter, they should be fenced to protect them from livestock. Where natural shelter is not available, a windbreak fence, 20% open, should be erected. A snow fence should be placed 30 m (100 ft) or more beyond the windbreak fence to reduce snow accumulation in the pens.

Other considerations in selecting a site include:

- the availability of power for lighting, feed processing and handling, water pumping, and frost-proof water bowls:
- an all-weather road for access to feed and for receiving and shipping cattle;
- proximity to feed supplies and cattle markets;
- space for possible expansion.

Feedlot Layout

The layout of the feedlot will be determined largely by the topography of the site and the type of feeding system used. Pens grouped around a central feed processing area allows feed to be distributed in a small to medium-sized feedlot without wagons. This system seriously limits possible expansion. Long rows of pens, on the other hand, are suitable for fenceline feeding as well as self-feeding and permit ready expansion.

An essential point to consider in designing a layout is the ease of moving cattle, feed, and manure. Alleys should be graded, gravelled, and higher than the pens unless they are to be used as drainage channels.

Cattle alleys should be a minimum of 3.6 m (12 ft) wide. Feed alleys should be at least 5 m (16 ft) wide where snow is not a problem and 10 m to 12 m (33-40 ft) wide where snow may accumulate. The wider alley allows for snow to be quickly pushed to the centre immediately after a storm leaving room for the feed wagon to reach the fenceline feedbunks on either side. Later, the snow can be removed as time permits. Alleys 10 m (33 ft) wide leave room for hauling manure provided the pen gates are set on an angle to the alley. If gates are parallel to the alley, wider alleys and wide gates are needed to make room for the tractor and spreader.

Feeding Facilities

There is a large variety of feeding systems used for beef cattle. Hay and silage can be self-fed from storage using an electric wire or portable feeding fence. Alternatively, the hay or silage can be transported to fixed or portable feed fences or racks or spread in feed bunks. An important aim in the design and the management of these feeding systems is to reduce the amount of feed that is wasted by the cattle. Plans and management information on various types of feeders are available in the Canada Plan Service Beef Series distributed by Manitoba Agriculture.

Grain or complete rations are generally fed in self feeders or feed bunks.

Self feeders: These offer low capital cost and low labor requirements as they are filled about once a week. This is important in small feedlots without full-time labor. Also there is more time to remove snow after a storm when cattle are fed only once a week.

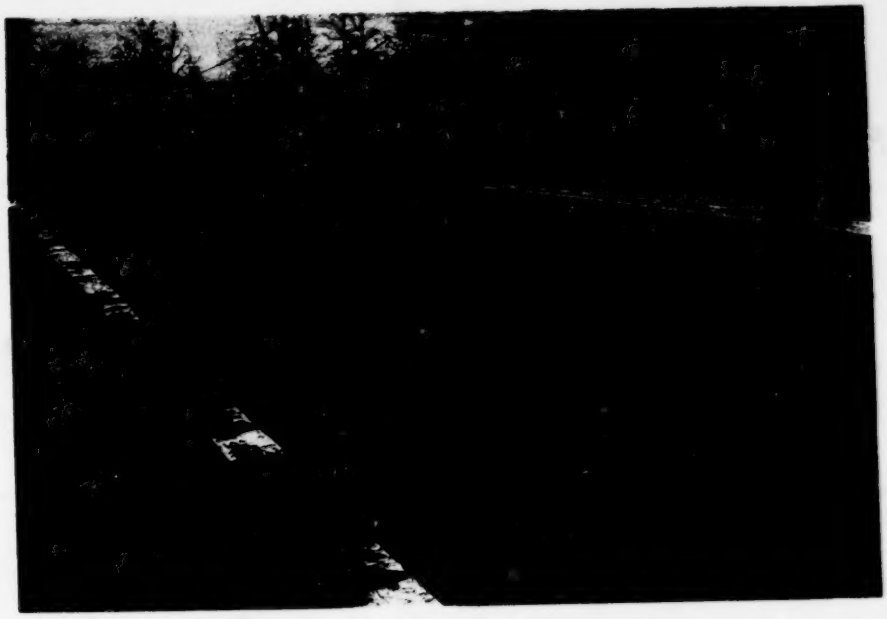
The disadvantages are that it is not easy to change the ration during the feeding period or move cattle from pen to pen before the feeders are empty. Allow 75 to 100 mm (3 to 4 inches) of space at the feeder per head.

Self-feeders work well in small feedlots.

Feedbunks: These can be kept filled continuously, so cattle always have feed in front of them or filled two or three times a day, in which case the cattle clean up the feed in 20 or 30 minutes. Both allow you to adjust the ration from day to day to meet the cattle's changing requirements. They also permit the movement of cattle and the ration from one pen to another at any time.

In the continuously filled bunks feed is distributed by mechanical conveyor or self-unloading wagon. Allow 150 to 250 mm (6-10 inches) of bunk space per head depending on the size of cattle and type of ration. If this type of system is not under roof the feed is exposed and a considerable amount can be lost or spoilt by wind, rain or snow.

This problem is avoided when feedbunks are filled only two or three times a day and the feed is cleaned up fairly quickly. This system has an added advantage in that the cattle come to the feedbunk as soon as the feed is distributed unless they are off-feed for one reason or another. This simplifies the problem of identifying sick animals in the pens. The disadvantage of this system is the additional cost of providing the length of bunk required. Allow 550 to 650 mm (22 to 26 inches) of bunk space per head.



Rations can be changed quickly when cattle are fed in feedbunks.

Wind and Snow Control

In Manitoba, wind is probably the most troublesome weather factor in feedlot operations and prevailing winds should be studied before a site is selected. Beef cattle on full feed are usually not affected greatly by extreme cold unless they are also exposed to strong winds.

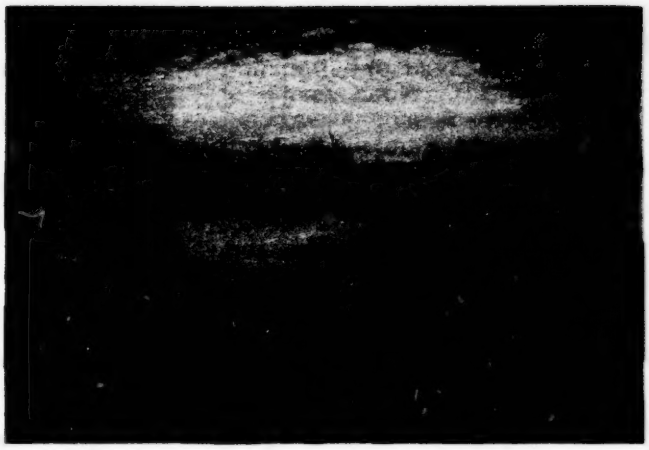
It should be remembered that wind currents around feedlots are affected by man-made obstructions such as buildings, hay stacks and fences, as well as natural features such as hills, ravines, and trees.

Wide shelterbelts, either natural or planted, provide excellent wind protection. The windward row of trees should be located at least 50 m (165 ft) from the pens to allow for snow accumulation behind the trees. Where additional wind protection is desired, windbreak fences can be used. The first line of defence for an unprotected feedlot could be an ordinary snow fence to keep ground drift out of the lot plus a windbreak fence 30 to 50 m (100-165 ft) inside the snow fence to protect the pens.

Windbreak fences should be at least 2.4 m (8 ft) and preferably 3 m (10 ft) high. Slotted fences are preferable to solid ones since they provide protection over a greater distance. Wind passing over a solid fence draws some air from the leeward side, creating a slight vacuum. The main air stream over the fence is pulled down close to the surface of the lot in order to fill the vacuum. Therefore, solid fences give good protection close to the fence but little or none further away. Porous fences, that are 20% open [i.e. 200 mm (8 inch) boards, with 50 mm (2 inch) openings between them], allow sufficient air through to fill the vacuum on the leeward side so high velocity winds coming over the fence stay above the cattle for a considerable distance.

Open-front buildings are subject to undesirable drafts and snow problems. Wind and snow tends to enter the open front of these buildings because of the vacuum on the leeward side, similar to the effect of a solid fence. This is most noticeable in buildings that are open on the south side when a northwest or northeast wind is blowing. By opening the area under the eaves, the building acts more like a slotted fence with considerable reduction in the amount of wind and snow entering the open front. A shed that is completely exposed to wind from the rear should have a windbreak fence placed about 20 m (65 ft) away from the shed at right angles to the wind. This reduces the wind velocity and hence reduces the vacuum and turbulence created by the building. Wind approaching at an angle to the open front tends to enter the building and sweep through its full length at increased velocity. Solid partition walls spaced at 12 m (40 ft) intervals will reduce this undesirable effect. A windbreak fence can protect an open-front shed when the wind is blowing directly into the shed from the south. The fence should be constructed as close as feasible to the building. To be of any value the fence should not be more than eight or nine times its own height away from the open front.

Natural shelter and porous fencing protect cattle from wind.



Open-end sheds provide better wind and snow control than open-side sheds.

Open-front sheds should not be built against existing buildings so that the wall of the existing building serves as one end wall of the shed and extends forward from the open front. This tends to divert wind currents into the shed. Instead, the new shed should be placed at least 12 m (40 ft) away from the existing building, with a windbreak fence across the opening. Wind and snow are then diverted into the empty space between the buildings where they won't bother the cattle in the shed.

For the same reason, windbreak fences should not be extended straight out from the corner of a shed. Rather, the fence should be built at least 5 m (16 ft) back from the front of the shed and 5 m out from the front corner to provide a turbulence chamber where the wind can harmlessly deposit the snow. This "turbulence chamber" can be as large as 15 metres square.

Open-end sheds provide better wind and snow control than open-side sheds. However, it is important to provide openings under the eaves and along the ridge for ventilation to prevent the accumulation of moisture. Plans are available from Manitoba Agriculture for open-end pole frame sheds with 12 m, 15 m, and 18 m clear spans (40 ft, 50 ft, 60 ft).

Snow that falls on the feedlot is not usually a serious problem except around self-feeders and feedbunks where it adds to the manure and contributes to ice build-up. This can be alleviated by pouring concrete aprons with at least a 1:12 (8%) slope away from the feeder so the cattle tramp the manure away. In addition, the feeders should be located so that the sun shines on these areas at least part of the day. For this reason cattle should not be allowed to feed on the north side of a feeder.

The map (Figure 3) indicates the most prevalent and strongest winter winds in several Manitoba locations. The winds are quite variable from place to place and they also blow from several directions other than the "prevailing" one.

The map indicates the directions from which wind protection is most needed when building a feedlot. However, it must be remembered that local topography can alter wind patterns considerably.

Figure 1

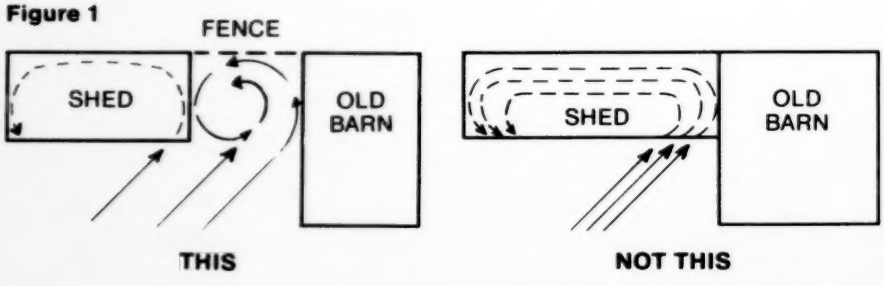


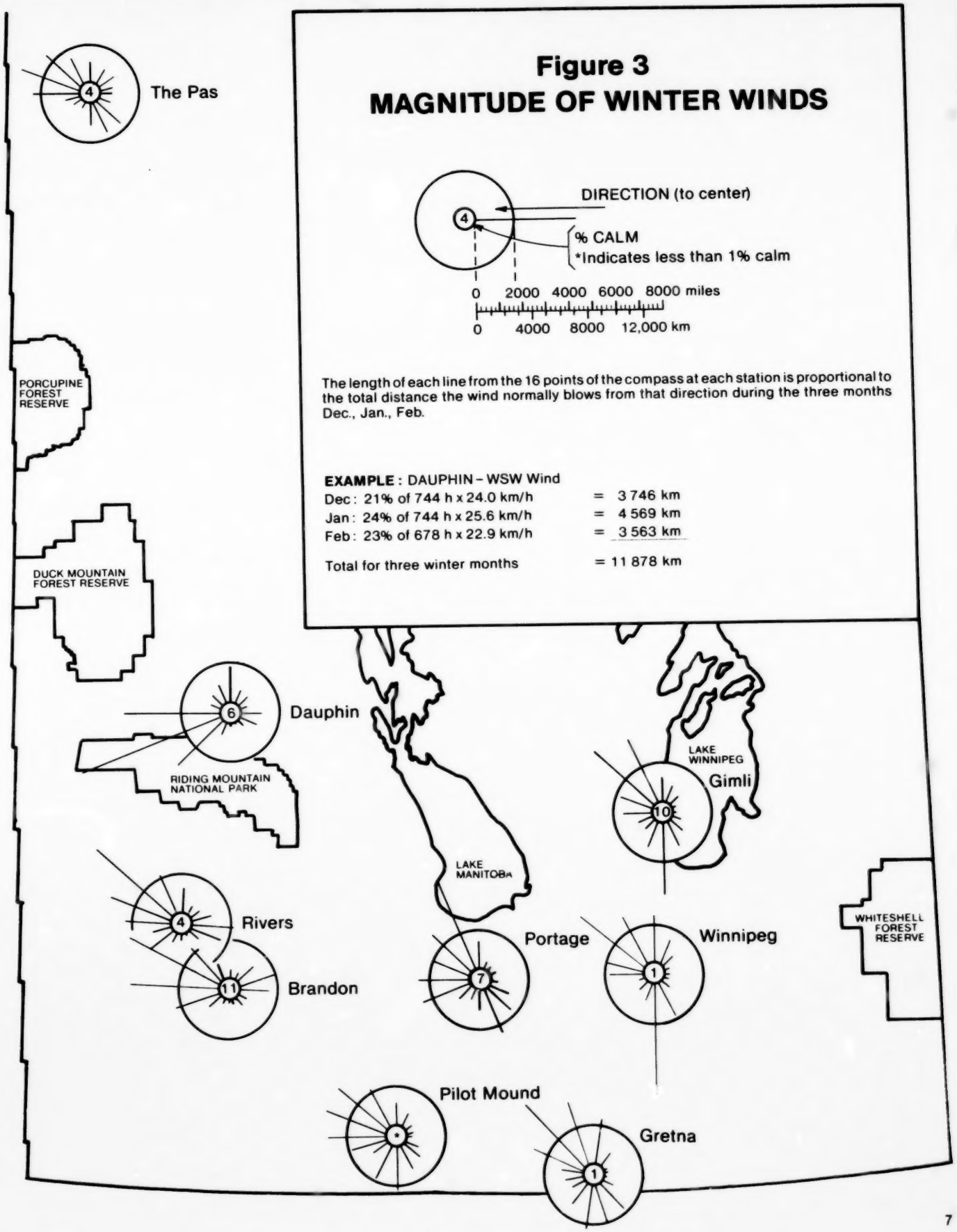
Figure 2

Figure 3
MAGNITUDE OF WINTER WINDS

The length of each line from the 16 points of the compass at each station is proportional to the total distance the wind normally blows from that direction during the three months Dec., Jan., Feb.

EXAMPLE : DAUPHIN – WSW Wind

Dec : 21% of 744 h x 24.0 km/h	= 3 746 km
Jan : 24% of 744 h x 25.6 km/h	= 4 569 km
Feb : 23% of 678 h x 22.9 km/h	= 3 563 km
Total for three winter months	= 11 878 km



More on Facilities

Detailed specifications on space, shelter, feeding, watering, manure disposal, runoff control, and livestock handling facilities are given in:

Guidelines for Planning Beef Cattle Facilities,
Manitoba Agriculture
Publication No. 509, 1982

Other useful publications are:

Snow and Wind Control for Farmstead and Feedlot,
Agriculture Canada
Publication 1461, 1978

Farm Feed Processing and Handling,
Agriculture Canada
Publication 1572, 1976

Cleaner Feedlot Cattle,
Agriculture Canada
Publication 1611, 1977

Canada Animal Manure Management Guide,
Agriculture Canada
Publication 1534, 1979

Installation and Operation of Automatic Heated Livestock Waterers,
Manitoba Agriculture,
Farm Facts 716-12-01

Livestock Water Quality,
Manitoba Agriculture,
Farm Facts 716-13-00

All the above publications are available through the offices of agricultural representatives or direct from:

Distribution Centre
Manitoba Agriculture
411 York Avenue
WINNIPEG, Manitoba
R3C 3M1
Telephone: 944-3845

Detailed plans of buildings, feeding equipment, handling facilities and other components are available from agricultural representatives, regional agricultural engineers, or:

Agricultural
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Manitoba Agriculture
911 Norquay Building
401 York Avenue
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Individual assistance is also available from the regional agricultural engineers, Manitoba Agriculture who may be contacted directly or through the agricultural representatives.

Feeder Cattle Classification

Canada's feeder cattle classification system has established a common language which buyers and sellers can use to describe feeders and stockers. A degree of standardization will be brought to the feeder cattle market if producers understand clearly the terms that are used in the new system. The classifications are designed to give the market an honest picture of how well the feeders will gain, grade and cut out at slaughter. To assess a feeder follow these four steps:

1. Note sex and weight.
2. Determine health, thrift and type.
3. Determine degree of fleshing.
4. Determine frame size.

Cattle showing obvious signs of sickness, unthriftiness or conformation defects are classified as "off type." Conformation defects include double muscling and dairy type muscling.

Degree of Fleshing

The degree of fleshing is described as "lean" or "fleshy." Most stockers and feeders marketed off pasture will show little or no evidence of fat deposition and are classified as "lean." Animals fed grain on pasture or in a drylot and showing evidence of fat deposition are classified as "fleshy." Short keep cattle fall into the 'fleshy" category.

Feeders are classified as large, medium and small frame size.

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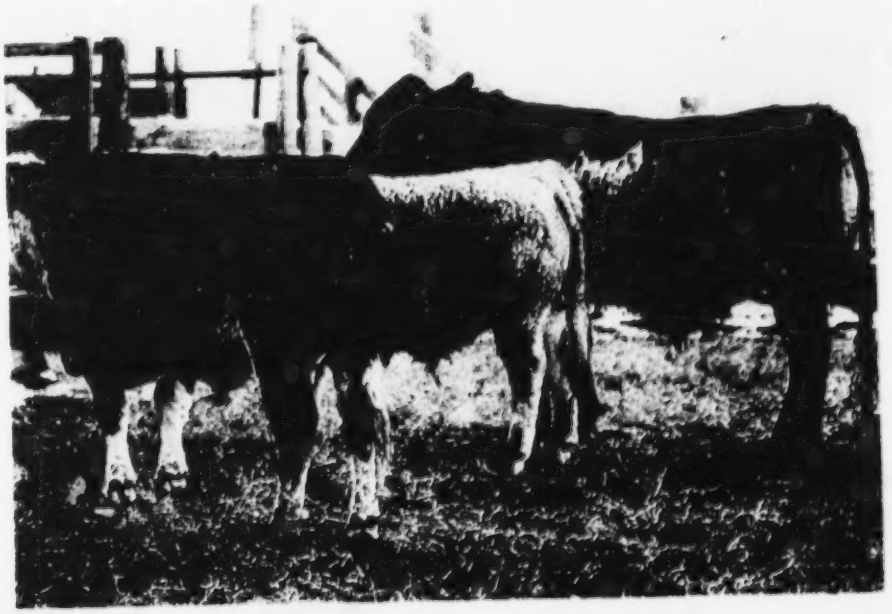


Feeders are classified as large, medium and small frame size.

Frame Size

Frame sizes are described as "large," "medium" or "small."

Large Frame Size

"Large" frame cattle are steers that are expected to weigh 545 kg (1200 lb) or more and heifers expected to weigh 455 kg (1000 lb) or more when an A1 or A2 finish is achieved. Most of the slow maturing exotic beef breeds and exotic crossbreds would be classified as large frame cattle.

Medium Frame Size

A large proportion of feeder cattle are classified as "medium" frame. Steers in this category would be expected to reach an A1 or A2 finish at a liveweight of 455-545 kg (1000-1200 lb) while heifers would reach a similar finish at 385-455 kg (850-1000 lb). British beef breeds and exotic crossbreds, which have been on high energy rations since weaning, are generally placed in this category.

Small Frame Size

"Small" frame cattle include steers expected to reach an A1 or A2 finish at less than 455 kg (1000 lb) and heifers obtaining the same degree of finish at less than 385 kg (850 lb). Very early maturing cattle and "medium" frame calves, which have been on high energy rations since weaning, fall into this category.

The six classes of normal, healthy feeder cattle are outlined in Table 1.

Table 1. Classification of normal, healthy feeder cattle.

	Degree of Fleshing	
Frame Size	Lean	Fleshy
Large	Large Lean	Large Fleshy
Medium	Medium Lean	Medium Fleshy
Small	Small Lean	Small Fleshy

Preconditioning Calves

Preconditioning is a management technique which can minimize economic losses by preparing calves to better handle the stress of weaning and being moved to a feedlot. Preconditioned calves should be castrated, dehorned, immunized, treated for parasites, implanted, weaned and introduced to the use of water troughs or bowls and feed bunks while on the farm.

Castration and Dehorning

It is recommended that calves be dehorned and castrated, if this is being done, before they are turned out on pasture with the cows. This avoids problems with flies and heat. However, if these practices are left until later in the season, they should be done at least 60 days prior to moving the calves into a feedlot to ensure proper and complete healing.

Immunization

Calves should be immunized at least 20 days prior to weaning.

Vaccinations should include Blackleg (use a 7 or 8 way vaccine), Infectious Bovine Rhinotracheitis (IBR), Para Influenza$_3$ (PI_3) and may include Hemophilus (I.T.E.M.E.) and Bovine Virus Diarrhea (BVD). Stress may reduce the effectiveness of vaccinations, so the calves should be treated when they are nursing and in a familiar environment.

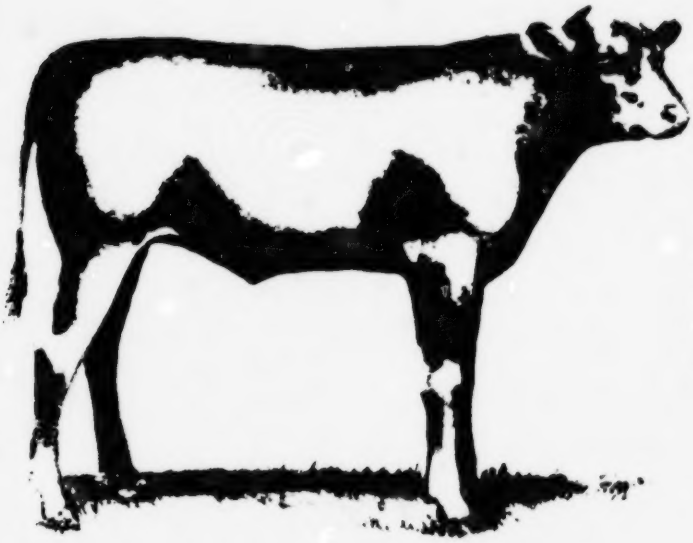
Proper immunization will reduce the effects of stress when calves are placed in the feedlot and protect them against outbreaks of some diseases when they are on feed.

Parasite Treatment

All calves should be treated for warbles two to four weeks prior to weaning. Systemic insecticides are simple to use and very effective. There is no reason for warble damage in feedlot cattle.

Calves may be dewormed if your veterinarian and/or feedlot operator feel it is necessary.

Preconditioned calves should be immunized 20 days prior to weaning.



Frame Size

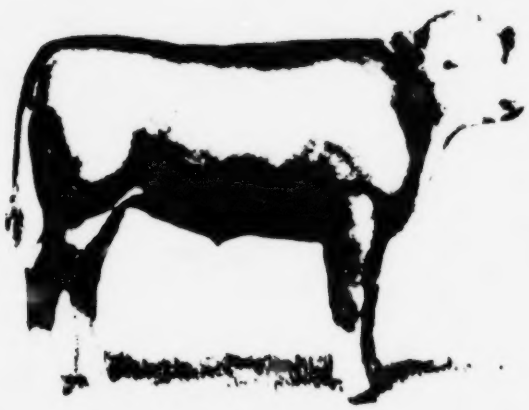
Frame sizes are described as "large," "medium" or "small."

Large Frame Size

"Large" frame cattle are steers that are expected to weigh 545 kg (1200 lb) or more and heifers expected to weigh 455 kg (1000 lb) or more when an A1 or A2 finish is achieved. Most of the slow maturing exotic beef breeds and exotic crossbreds would be classified as large frame cattle.

Medium Frame Size

A large proportion of feeder cattle are classified as "medium" frame. Steers in this category would be expected to reach an A1 or A2 finish at a liveweight of 455-545 kg (1000-1200 lb) while heifers would reach a similar finish at 385-455 kg (850-1000 lb). British beef breeds and exotic crossbreds, which have been on high energy rations since weaning, are generally placed in this category.



Small Frame Size

"Small" frame cattle include steers expected to reach an A1 or A2 finish at less than 455 kg (1000 lb) and heifers obtaining the same degree of finish at less than 385 kg (850 lb). Very early maturing cattle and "medium" frame calves, which have been on high energy rations since weaning, fall into this category.

The six classes of normal, healthy feeder cattle are outlined in Table 1.

Table 1. Classification of normal, healthy feeder cattle.

	Degree of Fleshing	
Frame Size	Lean	Fleshy
Large	Large Lean	Large Fleshy
Medium	Medium Lean	Medium Fleshy
Small	Small Lean	Small Fleshy

Preconditioning Calves

Preconditioning is a management technique which can minimize economic losses by preparing calves to better handle the stress of weaning and being moved to a feedlot. Preconditioned calves should be castrated, dehorned, immunized, treated for parasites, implanted, weaned and introduced to the use of water troughs or bowls and feed bunks while on the farm.

Castration and Dehorning

It is recommended that calves be dehorned and castrated, if this is being done, before they are turned out on pasture with the cows. This avoids problems with flies and heat. However, if these practices are left until later in the season, they should be done at least 60 days prior to moving the calves into a feedlot to ensure proper and complete healing.

Immunization

Calves should be immunized at least 20 days prior to weaning.

Vaccinations should include Blackleg (use a 7 or 8 way vaccine), Infectious Bovine Rhinotracheitis (IBR), Para Influenza$_3$ (PI$_3$) and may include Hemophilus (I.T.E.M.E.) and Bovine Virus Diarrhea (BVD). Stress may reduce the effectiveness of vaccinations, so the calves should be treated when they are nursing and in a familiar environment.

Proper immunization will reduce the effects of stress when calves are placed in the feedlot and protect them against outbreaks of some diseases when they are on feed.

Parasite Treatment

All calves should be treated for warbles two to four weeks prior to weaning. Systemic insecticides are simple to use and very effective. There is no reason for warble damage in feedlot cattle.

Calves may be dewormed if your veterinarian and/or feedlot operator feel it is necessary.

Preconditioned calves should be immunized 20 days prior to weaning.

Implanting

Growth stimulant implants increase weight gains and decrease the amount of feed needed to reach slaughter weights. Calves which are going to be fed out for slaughter should be implanted two to four weeks prior to weaning. Manufacturers instructions concerning weight ranges for implantation should be followed. Replacement animals should not be implanted.

Adjusting Calves to Feed and Water

Shrinkage on calves entering a feedlot can be reduced if they are already accustomed to eating dry feed and drinking from a water bowl. After weaning, calves should be provided with good quality, long grass hay and fresh water. Splash water out of the water bowl or allow some to overflow the bowl for the first day to entice calves to drink.

If calves have been creep-fed, it can be continued with a roughage diet after weaning. Creep-fed calves adjust to a feedlot environment readily.

Weaning

Weaning is likely the largest single stress factor a calf will face. Stress can be kept to a minimum by separating the cows from the calves and keeping them as far as possible from each other. Ideally calves should not be able to see, hear or smell their dams. Do not add any more stress at weaning by castrating, dehorning, vaccinating or trucking the calves. Preconditioned calves should be weaned at least 30 days before they are introduced to a feedlot.

Benefits of Preconditioning

Preconditioned and preweaned calves are better equipped to withstand the stresses of shipping and a new environment than freshly weaned calves. Calves weaned prior to shipping suffer from stress for three to seven days. They have a shrink of 3%-5% but make that up in 10-15 days on feed. Calves that are weaned one day and shipped the next suffer from stress for 15-21 days.

Calves weaned 30 days prior to marketing also develop less respiratory disease.

Preconditioning is a sound management practice and should be followed by all producers, whether they are selling calves, feeding them on their own farms, or placing them in a custom feedlot.

Producers can take advantage of certified preconditioning programs in which a veterinarian certifies that certain management practices have been done. The certification is necessary when selling the calves, since preconditioned calves do not look as attractive as ones that are freshly weaned. Certification guarantees the buyer that these calves have been treated and should be worth more than non-preconditioned calves. Custom feedlot operators should also be able to offer a better rate on feeding certified calves, especially if their fee is based on a cost per rate of gain.

A herd health evaluation can be done when the veterinarian certifies your calves.

Management of Feeder Cattle

Shipping

Transit time and conditions are important factors in controlling the shrink and diseases of incoming feedlot cattle. Truck vibration, crowding, cold, overheating, thirst, fear, anxiety, and fatigue all contribute to shrinkage and the occurrence of disease. For this reason, the cattle industry must impress upon everyone involved in all phases of transportation and marketing, the importance of quiet, efficient transportation and handling of animals.

Shrinkage

There are two types of loss due to shrinkage:

- Excretory shrinkage or loss of belly fill. Animals held off feed and water for 12 hours usually suffer excretory shrink but their weight usually goes back to normal soon after they refill their stomachs with feed and water.
- Tissue shrink is a more serious decrease in the carcass weight of the animal. It occurs during long extended hauls or periods of fasting.

Of course, both types often occur simultaneously. The largest shrinkage occurs in loading and unloading when the stress is greatest, and in the first one to three hours of hauling, before the cattle have settled down. Tissue shrinkage is relatively more pronounced towards the end of a long trip. One study showed that cattle lost an average 0.61% in shrink for every 160 kilometres (100 miles) in transit.

Many other conditions affect the shrinkage of cattle:

- The type of feed they eat before shipping. Cattle on grass or silage shrink 4%, while fat cattle on concentrated feed shrink only 2.5%-3% when no feed or water is available.
- When they eat. If feed and water are available free choice, morning weights will be about 2% less than evening weights.
- Where the cattle are purchased. In one study of 4,685 feeder cattle purchased directly from a rancher showed an average shrink of 7.2% compared to 9.1% for cattle purchased at a sale yard.
- Strange surroundings. Range cattle held in strange enclosures often shrink more than 5% overnight.
- Extreme changes in temperature. Wind, rain, snow, humidity and wet weather will worsen the effects of temperature.
- Castration and dehorning frequently produce a 20%-25% shrink.
- Transit time.

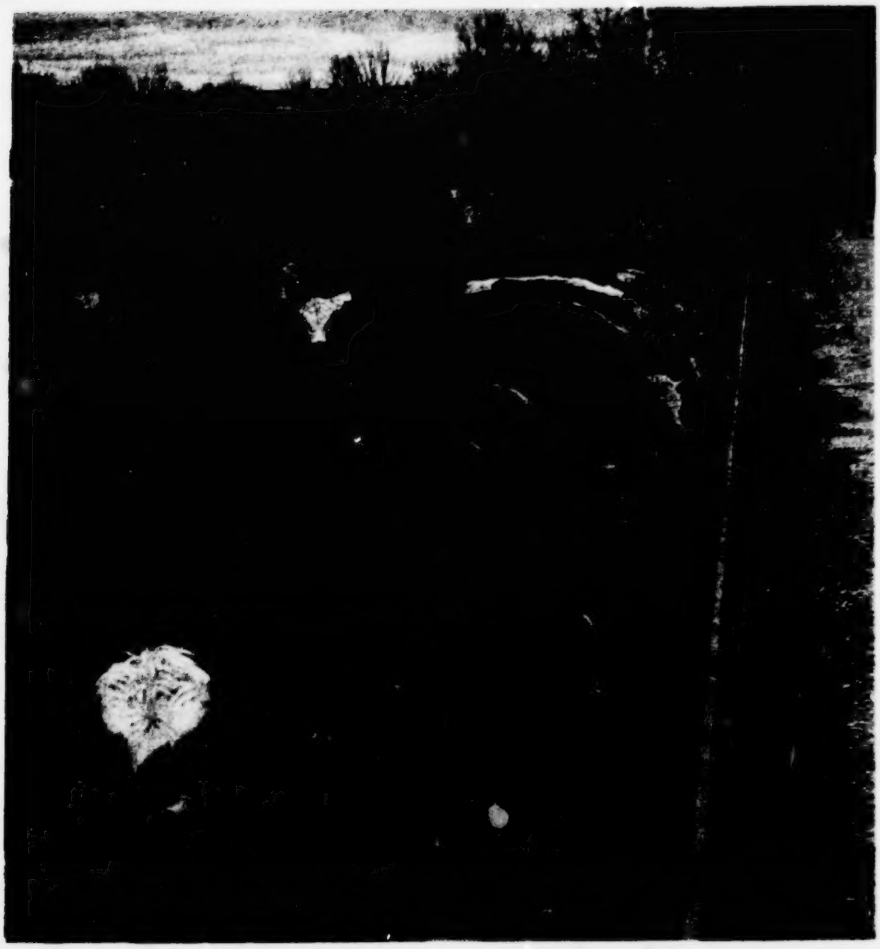
To minimize shrinkage losses a producer must keep an eye on weather forecasts, avoid rough handling, poor feed, dirty water and, where he can, eliminate excessive delays enroute or at the auction market. Avoid overloading. Underloading can also cause heavy shrinkage. Use partitions in large trucks or rail cars so the cattle don't have too much room to move around.

New Feedlot Arrivals

There are many different methods of handling newly arrived feeder cattle and no one way is suitable for every occasion. The program should be suited to the particular feedlot and will depend upon the area, as well as the origin and condition of the cattle, the feed, weather conditons and management of the feedlot.

The objective, especially during the animal's first 30 days in the feedlot, should be to minimize stress. The most important procedures to follow are:

- Move the animals quickly and calmly. Avoid handling as much as possible during the first 14-30 days.
- When animals are unloaded take their temperature and examine them thoroughly. Animals with a temperature of 40 C (104 F) or higher should be isolated and treated. If more



Cattle that are introduced to the feedlot with a minimum of stress perform best.

than 10% of the calves are sick, it may be necessary to treat the entire group with antibiotics, following a veterinarian's advice.

- Provide shelter and bedding to protect them against the weather. Before the calves enter the feedlot it should be thoroughly cleaned. (Exposure to sun and air will reduce the carry-over of infectious diseases). The shelter should be well bedded.
- Avoid muddy pens or very dusty conditions.
- Avoid mixing newly arrived cattle with any other calves for 30 days.
- Sort cattle into uniform size groups.
- Keep pen numbers to less than 150 head.
- Avoid overcrowding.
- Fill cattle with hay after they arrive and before they have access to water.
- Start them slowly on feed. Feed calves three to four times a day for the first week.
- Provide loose salt.
- Provide clean, fresh water. Continuous flow water troughs are helpful during the first couple of days.
- When finishing newly weaned calves on the home farm, keep cows and calves separated, preferably out of sight and sound of each other. This reduces the time spent bawling and fence walking. Fence walking increases the dust level in the lot, and both bawling and fence walking increase susceptibility to respiratory infections.

Processing New Arrivals

Ideally cattle should be processed before they are weaned and shipped. In practice, however, the majority of calves have not been processed before they arrive in the feedlots.

Processing includes:

- Vaccinations – I.B.R., PI_3, and blackleg are necessary for all cattle. Hemophilus and B.V.D. are optional
- Implants
- Treatment for ectoparasites lice, warbles
- Deworming
- Identification – branding, eartags

There are two opposing schools of thought on when to process incoming cattle which have not been preconditioned. Some experts feel that processing should be delayed for two to three weeks after the calves arrive. They argue that cattle suffering from the stress of shipping and adjusting to a new environment may not develop a satisfactory immunity to vaccines at that time, and the added stress of processing increases the chance of sickness. Others feel it is better to get all the stresses over with at once. They feel that the protection of vaccination should not be delayed and the cattle should be processed on arrival, rather than subjected to further stress after they settle down. In research trials where delayed processing was compared to immediate processing, sick calves in the delayed groups required more prolonged initial treatment. There were also more repeat treatments, deaths and chronically sick animals in the delayed groups. A good compromise between the two systems is to vaccinate for I.B.R. and blackleg immediately on arrival and delay the other procedures for three weeks when the cattle have settled down. It is recommended that you consult with your veterinarian to obtain specific vaccination recommendations tailored to your operation.

Managing Feedlot Heifers

There are several factors to consider when feeding heifers.

Heifers may be expected to gain 5%-10% slower and less efficiently than steers. They reach an A1-A2 finish at lighter weights and care must be taken to avoid producing carcasses which are overfat. The price per kilogram for heifers is also less than that paid for steers.

The occurrence of estrus cycles can be a major problem when dealing with feedlot heifers. To prevent heifers from cycling normally and thus expending energy on the restless behaviour associated with estrus, melengestrol acetate (MGA) may be added to the feed. In addition to controlling estrus behavior, MGA also improves growth and feed efficiency. For recommendations concerning the use of MGA, consult the section on growth promotants.

If heifers are pregnant, their feedlot performance will be affected. The decision on how to handle the pregnant heifers is a management one and will be based primarily on the stage of pregnancy.

Managing Feedlot Bulls

Bulls grow faster and more efficiently and produce carcasses with a higher lean-to-fat ratio than steers. However, feeding bulls is not a common practice because of the behavioral and marketing problems associated with them.

After the onset of puberty a bull's behavior becomes erratic and there are several management points that should be kept in mind when feeding bulls.

- Avoid placing strange bulls in the pen with a group of bulls that have adjusted to each other. This will disrupt the established pecking order and result in fighting.
- Strange bulls may also fight across fences. Keep bulls from the same farm in adjacent pens or, if possible, place a pen of steers between the bull pens.
- Pen bulls away from heifer pens.

Bulls should be marketed on a rail grade basis. Prior to marketing, make arrangements with the packing house. The time of delivery should be established beforehand, and, on arrival, the bulls should go directly to slaughter. This will help prevent a high percentage of dark cutters, a condition caused by stress prior to slaughter.

Virgin bull carcasses will grade in the steer categories provided they have adequate fat cover, are not dark colored, and do not show mature bull characteristics. Bulls should be started on a high grain ration soon after weaning to prevent insufficient marbling and fat cover. Bulls that are backgrounded on forage based rations for a long period of time and large frame European type bull calves have more chance of being classified as stags or of producing too lean a carcass at an acceptable carcass weight.

Feeding Management

The ultimate aim of the feedlot operator is to produce a maximum net profit on every animal. To do this, the animal must achieve the proper weight and fat cover at the same time to reach an acceptable grade. The feedlot operator must balance the ration to accurately supply all the nutrients that are required to achieve the desired rate of gain. The most economical rate of gain will depend primarily on, the cost of grain, roughage, yardage and interest.

Cost of gain increases as animals increase in weight for two reasons. Firstly, more energy is required per kilogram of gain as the proportion of fat laid down increases, since fat is high in energy. Secondly, as cattle put on increasing fat cover, they tend to consume less energy above their maintenance requirement, leaving less energy for gain. It becomes increasingly difficult to keep cattle on feed as they increase in fatness. Maximum profits are achieved when cattle are slaughtered as soon as they have enough fat cover to grade A1, A2. It is wise to keep cattle on feed until you are sure they have enough fat to grade A1, A2, rather than have them drop into the B or C grade due to lack of finish.

Planning a Feeding Program

Several factors must be considered before deciding on a specific feeding program. Animals differ widely in their genetic ability to grow; not only in rate of gain, but also in the proportion of fat and lean put on. While one type of animal on a particular diet may finish at 400 kg (900 lb), another, treated exactly the same, may need to put on an extra 135-180 kg (300-400 lb) to attain the same level of fat cover. In addition, steers, heifers and bulls all utilize feed differently and must be fed accordingly. The same applies to similar animals of different ages.

Every animal requires five specific nutrients – energy, protein, minerals, vitamins and water. The amount of each nutrient required by any specific animal depends on its age, weight, sex, frame size and the desired rate of gain. In order for feed to be used efficiently, all nutrients must be present and in proper proportions. For example, if other nutrients are present in the ration to support an average daily gain of 1 kg (2.2 lb), but only enough energy to gain 0.5 kg, the animal will gain only 0.5 kg. The other surplus nutrients will be largely wasted.

Nutrient requirements for cattle are given on a 100% dry matter basis. This is done to enable accurate ration formulation when using feeds of widely different moisture content such as air dry feeds (88% dry matter) and silages (30%-45% dry matter). Rations are calculated on a 100% dry matter basis, then individual ingredients converted to an "as fed" basis. Feed company tags give nutrient levels on an as fed basis.

During the growing period, gains should be in the 0.7-0.8 kg/day (1.5-1.75 lb/day) range. Small cattle should weigh approximately 350 kg (775 lb) before being fed a high energy finishing ration. Large frame cattle require a shorter growing period and can be put on finishing rations at 290 to 315 kg (650-700 lb). Large type dairy steers can be put on high energy finishing rations at 180 to 225 kg (400-500 lb).

Starting Cattle on Feed

The objective of the starting period is to acclimatize animals to their new environment and start them on feed as soon as possible. In order to do this, the bacterial population in the rumen must be changed from one adapted to digesting mostly hay or grass to one that can handle a ration consisting mostly of grain. This is accomplished by gradually increasing the grain portion of the ration over 14-21 days. Increasing

the grain ration too quickly can result in serious digestive upsets, such as founder and acidosis, and, quite possibly death.

Preconditioned calves are accustomed to grain before weaning, but most calves arriving at the lot will have known nothing but milk and grass. This may cause problems if the preconditioned calves overeat on the grain not consumed by the freshly weaned calves. For this reason the feeding program should be kept flexible and adjusted for each group or pen of calves as they arrive.

There are many ways to accustom cattle to feed. Large feedlots may use five or six ration changes to gradually increase the energy level. Smaller feedlots commonly use three specific rations – a low energy starter, a medium energy grower and a high energy finisher. As the operator gains experience, he will develop his own suitable methods. He may also be able to shorten the time needed to put cattle on full feed.

After a few days in the feedlot, the cattle may be fed 1/2 to 1 kg (1-2 lb) of grain daily. After three to four days at this level, the grain intake can be increased by 1/2 kg (1 lb) per day until the cattle are consuming approximately one kilogram of grain per hundred kilograms of body weight. Further increases may be made at the rate of 1/4 kg (1/2 lb) per head per day and slowly reducing the hay portion. This can be continued until the animals are eating all the grain and about 2 kg (4 lb) of hay per day.

The grain should be rolled or coarsely ground. Avoid a high percentage of fines as they can cause digestive upsets.

Commercial starter rations can also be used when placing animals on full feed. Recommendations provided by the feed company should be followed when using starter rations.

The Finishing Period

Digestive problems during the finishing stage usually result from eating too much high energy feed at one time or from irregular consumption of high energy feed. These digestive upsets may be mild or severe enough to cause death.

The objective of the finishing period is to keep the rumen full without overeating. This can be accomplished by the following steps:

- Do not allow cattle to be without feed for more than one to three hours.
- If the bunks are empty, and cattle are hungry, feed an intermediate ration with a reduced energy level. This should be done following storms, when cattle are out of feed; when feedbunks are licked clean and when cattle appear gaunt.
- Avoid unnecessary changes in rations.
- Avoid changes of ingredients by checking inventories and reordering promptly.
- Be sure each batch of feed is completely mixed. Ration changes and incomplete mixing frequently result in reduced intake or overconsumption.
- Don't increase the grain portion of a ration when feed consumption is increasing.
- Avoid prolonged sorting of fat cattle.
- Avoid fines in the ration. Finely ground feed can cause irregular consumption and digestive upsets. Fines can be avoided by keeping meal type ingredients to a minimum. Molasses can be used to bind the fines and improve palatability. Hammering or overmilling of grain and the use of fine ground roughages lead to many fines in the feedbunk.

Growth Promotants

In recent years, many feed additives and implants have appeared on the market. These have been thoroughly tested under feedlot conditions and found to be effective. Feed additives and implants should be used to cut production costs.

The expected performance from implants and feed additives, and recommendations for their use are outlined in Table 2.

Ration Ingredients

Energy

Between 70% and 80% of the cost of finishing cattle, excluding the cost of the animal is feedstuffs – grains, roughage, various by-products and supplements. Of the five nutrients, energy is required in by far the greatest amount and is the largest cost item in the ration. For this reason, the value of a feed ingredient is based primarily upon the energy it will provide. This is assuming it is not used as a supplement to provide protein, minerals, vitamins or additives.

Broadly speaking, two methods of measuring energy are used in North America – the Total Digestible Nutrient (TDN) system, and the calorie system which measures Digestible Energy (D.E.), Metabolizable Energy (M.E.), and Net Energy (N.E.). The TDN system places a percentage value on the total digestable energy in a feed. The calorie system expresses energy in terms of calories of digestive energy – that portion of the total energy in a feed not excreted in the feces. A practical conversion factor is 0.45 kg (1.0 lb) of TDN = 2,000 kilocalories D.E. or 2 megacalories D.E. The energy content of grains depends to a great extent on bushel weight. As bushel weight decreases fibre content increases and energy is lower.

The average nutrient content of commonly used feedstuffs is given in Table 3.

Barley, oats, corn, wheat and rye are the grains commonly used for adding energy to the ration. Oats

Table 2 Growth Promotants

Name	Method For Use	Restrictions on Use	Effect on Performance ADG	FCE	Length of Effectiveness	Withdrawal Period
Synovex S	Ear implant	For steers over 400 lb (180 kg) only.	+10-15%	+10-15%	100-120 days	None
Synovex H	Ear implant	For heifers over 400 lb only. Not to be used for breeding stock.	+8-12%	+10-15%	100-120 days	None
Ralgro	Ear implant	Fo: steers, heifers and suckling calves. Not to be used for breeding stock.	+10-15%	+10-15%	100-120 days	65 days
Rumensin	Feed additive	11 g/tonne feed dry matter for first 28 days, increased to 33 g/tonne feed dry matter for remainder of feeding period.	-	+6-10%	-	None
MGA	Feed additive	For cycling heifers 0.4 mg/head/day.	+8-12%	+6-8%	-	48 hours
Compudose	Ear implant	For steers over 600 lb. (270 kg) only.	+13-17%	+6-7%	200 days	None
Steeroid	Ear implant	For steers over 400 lb.	+10-15%	+10-15%	100-120 days	None

Table 3. Average Nutrient Content of Commonly Used Feeds (100% Dry Matter Basis)

	Total Digestible Nutrients (TDN) %	Crude Protein (CP) %	Calcium (Ca) %	Phosphorus (P) %
GRAINS				
Wheat	88	13	0.05	0.45
Barley	83	12	0.05	0.37
Oats	76	11	0.07	0.40
Corn	90	10	0.03	0.31
Rye	80	12	0.07	0.36
PROTEIN SUPPLEMENTS				
Canola Meal	72	41	0.66	1.20
Soybean Meal	83	49	0.40	0.75
Brewers Grains	70	24	0.35	0.60
Distrillers Grains	80	28	0.10	0.80
Alfalfa Pellets	60	18	1.50	0.20
Urea	0	280	0.00	0.00
FORAGES				
Oats & Barley (Late Milk – Early Dough Stage)	65	10	0.30	0.25
Corn Silage (Well Eared)	70	9	0.25	0.20
Corn Silage (Few Ears)	60	10	0.35	0.20
Alfalfa	60	18	1.50	0.20
Brome	55	12	0.40	0.25
Slough	52	8	0.30	0.20
STRAW				
Barley & Oat	47	5	0.15	0.15
Wheat & Rye	42	5	0.15	0.15

are highest in fiber and lowest in energy. For this reason oats, of all the grains, are least likely to cause digestive problems and are used in the greatest quantity in starting and growing rations. High energy finishing rations usually contain mainly barley or corn. Corn and/or barley can be used as the only grain in the ration. Bloat can be a problem when barley is fed with a legume as the roughage, especially if the barley is finely ground.

Unless special precautions are taken, wheat should be restricted to no more than 50% of the grain in finishing rations as it gets sticky and can cause digestive upsets.

Rye has been fed as the sole grain provided it contained no ergot, which is unusual. Due to concern over palatability, digestive upsets and the presence of ergot bodies, rye is commonly restricted to 25% to 40% of the grain ration. Ergot bodies can occur in any grain or grass seeds but are most common in rye and triticale. More than 0.1% ergot in the total diet will cause serious intake and health problems. Less than 10 ergot bodies per litre of whole grain is considered safe. For an accurate analysis of ergot concentrations take samples from several places in the bin.

Fats can be used to add energy to rations. Fats contain 2-1/4 times as much energy as grains, are 10% more digestible and therefore are worth 2.5 times the cost of grain as an energy source. Animal and vegetable fats can be used, and the selection should be based on price. Up to 5% fat can be added to high concentrate rations. Higher levels can cause digestive upsets and lowered feed consumption.

Molasses is a very palatable and readily available source of energy. It contains less energy than oats but is also used to decrease dust and increase feed consumption. Keep molasses to no more than 10% of the ration for maximum efficiency.

Grains high in oil such as whole canola seed are high in energy. However, the high oil content is the main factor limiting its use in the ration.

The composition of grain screenings determines their usefulness as a feed. The best grades of screenings consist of broken and shrunken kernels of small grains and contain about the same energy as oats. Screenings from oilseed crops may equal barley in energy and contain more protein. Light chaffy screenings with an abundance of small weed seeds have low feed value and are extremely variable in composition. Make sure that any source of screenings does not contain unpalatable or harmful factors such as ergot.

Frozen cereal grains are safe to feed but will be low in energy, particularly on a volume basis. Rust and smut damaged grains can be fed but dustiness and palatability can be a problem. Grain damaged by fire can be fed but is unpalatable, lower in energy, and commonly contains such things as nails and broken glass. Grain heated in bins is lower in energy but can be fed with no harmful effects provided it does not contain molds. Moldy feed is unpalatable and can cause serious respiratory problems for both man and beast. Moldy feed may contain toxins which can cause a variety of health problems including death.

Roughages

Roughage is fed either free choice or mixed with grain to make up at least 10% to 15% of feedlot rations for several very good reasons. Ruminants do best when some roughage is fed to provide a scratching stimulus to the rumen. Straight concentrate diets have been successfully fed, but gains and feed efficiency are actually lower than when 10% to 15% roughage is present. Roughage in the ration reduces the chances of digestive upsets, especially if the ration is changed in any way. An increase in the percentage of roughage consumed usually will not cause problems, while a sudden decrease can cause digestive upsets.

High quality roughages can replace a substantial portion of the grain in all but the final stages of finishing with little decrease in rate of gain. Animals will compensate to some degree for the lower energy content of the roughage by eating more. Due to the high energy required to put on fat, and the fact that cattle can only eat so much, gains on high forage rations will be appreciably lower during the fattening stage.

When the cost of energy from forage is high in relation to energy from grain use low quality roughages like straw. Additional energy, protein and minerals will be needed when poor quality roughage is fed. When economically feasible, ammoniation of low quality roughages will increase available energy and protein content. Check with your agricultural representative for details on how to ammoniate roughages. Use all recommended safety precautions.

Well preserved silage is a valuable cattle feed, and can form part or all of the roughage. Silages are palatable, dust free and prevent the separation of ingredients in the ration, especially reducing the amount of 'fines' in the feed bunks. The leafy portion of any forage is highest in protein and energy. An advantage of silage is that less of the leaf is lost in harvesting. Silage making and feeding is highly mechanized and dependence on bad weather is decreased. The cost and availability of labor, silos and equipment must be considered.

Corn and small grain silages are well suited to and popular in Western Canada. The energy level of these silages depends to a great extent on the amount of grain present. Well eared corn silage is highest in energy with a dry matter TDN of 70%. Small grain silage cut at the milk to early dough stage has a dry matter TDN of 65% – about the same as high quality alfalfa containing 20%-25% protein.

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Brewers Grains	70	24	0.35	0.60
Distrillers Grains	80	28	0.10	0.80
Alfalfa Pellets	60	18	1.50	0.20
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Oats & Barley (Late Milk – Early Dough Stage)	65	10	0.30	0.25
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Alfalfa	60	18	1.50	0.20
Brome	55	12	0.40	0.25
Slough	52	8	0.30	0.20
STRAW				
Barley & Oat	47	5	0.15	0.15
Wheat & Rye	42	5	0.15	0.15

are highest in fiber and lowest in energy. For this reason oats, of all the grains, are least likely to cause digestive problems and are used in the greatest quantity in starting and growing rations. High energy finishing rations usually contain mainly barley or corn. Corn and/or barley can be used as the only grain in the ration. Bloat can be a problem when barley is fed with a legume as the roughage, especially if the barley is finely ground.

Unless special precautions are taken, wheat should be restricted to no more than 50% of the grain in finishing rations as it gets sticky and can cause digestive upsets.

Rye has been fed as the sole grain provided it contained no ergot, which is unusual. Due to concern over palatability, digestive upsets and the presence of ergot bodies, rye is commonly restricted to 25% to 40% of the grain ration. Ergot bodies can occur in any grain or grass seeds but are most common in rye and triticale. More than 0.1% ergot in the total diet will cause serious intake and health problems. Less than 10 ergot bodies per litre of whole grain is considered safe. For an accurate analysis of ergot concentrations take samples from several places in the bin.

Fats can be used to add energy to rations. Fats contain 2-1/4 times as much energy as grains, are 10% more digestible and therefore are worth 2.5 times the cost of grain as an energy source. Animal and vegetable fats can be used, and the selection should be based on price. Up to 5% fat can be added to high concentrate rations. Higher levels can cause digestive upsets and lowered feed consumption.

Molasses is a very palatable and readily available source of energy. It contains less energy than oats but is also used to decrease dust and increase feed consumption. Keep molasses to no more than 10% of the ration for maximum efficiency.

Grains high in oil such as whole canola seed are high in energy. However, the high oil content is the main factor limiting its use in the ration.

The composition of grain screenings determines their usefulness as a feed. The best grades of screenings consist of broken and shrunken kernels of small grains and contain about the same energy as oats. Screenings from oilseed crops may equal barley in energy and contain more protein. Light chaffy screenings with an abundance of small weed seeds have low feed value and are extremely variable in composition. Make sure that any source of screenings does not contain unpalatable or harmful factors such as ergot.

Frozen cereal grains are safe to feed but will be low in energy, particularly on a volume basis. Rust and smut damaged grains can be fed but dustiness and palatability can be a problem. Grain damaged by fire can be fed but is unpalatable, lower in energy, and commonly contains such things as nails and broken glass. Grain heated in bins is lower in energy but can be fed with no harmful effects provided it does not contain molds. Moldy feed is unpalatable and can cause serious respiratory problems for both man and beast. Moldy feed may contain toxins which can cause a variety of health problems including death.

Roughages

Roughage is fed either free choice or mixed with grain to make up at least 10% to 15% of feedlot rations for several very good reasons. Ruminants do best when some roughage is fed to provide a scratching stimulus to the rumen. Straight concentrate diets have been successfully fed, but gains and feed efficiency are actually lower than when 10% to 15% roughage is present. Roughage in the ration reduces the chances of digestive upsets, especially if the ration is changed in any way. An increase in the percentage of roughage consumed usually will not cause problems, while a sudden decrease can cause digestive upsets.

High quality roughages can replace a substantial portion of the grain in all but the final stages of finishing with little decrease in rate of gain. Animals will compensate to some degree for the lower energy content of the roughage by eating more. Due to the high energy required to put on fat, and the fact that cattle can only eat so much, gains on high forage rations will be appreciably lower during the fattening stage.

When the cost of energy from forage is high in relation to energy from grain use low quality roughages like straw. Additional energy, protein and minerals will be needed when poor quality roughage is fed. When economically feasible, ammoniation of low quality roughages will increase available energy and protein content. Check with your agricultural representative for details on how to ammoniate roughages. Use all recommended safety precautions.

Well preserved silage is a valuable cattle feed, and can form part or all of the roughage. Silages are palatable, dust free and prevent the separation of ingredients in the ration, especially reducing the amount of 'fines' in the feed bunks. The leafy portion of any forage is highest in protein and energy. An advantage of silage is that less of the leaf is lost in harvesting. Silage making and feeding is highly mechanized and dependence on bad weather is decreased. The cost and availability of labor, silos and equipment must be considered.

Corn and small grain silages are well suited to and popular in Western Canada. The energy level of these silages depends to a great extent on the amount of grain present. Well eared corn silage is highest in energy with a dry matter TDN of 70%. Small grain silage cut at the milk to early dough stage has a dry matter TDN of 65% – about the same as high quality alfalfa containing 20%-25% protein.

Protein

Whereas energy is the fuel necessary to keep body systems going, protein is required for growth, maintenance and repair of body tissues. Young rapidly growing animals require the highest percentage of protein in the diet. The least amount of protein, as a percentage of the ration, is required in the fattening stage when body growth is slower and weight gain is largely due to laying down fat which contains no protein.

Protein supplements are expensive and excess protein, though it does no harm, increases the cost of the ration. On the other hand, as with other nutrients, a shortage of protein will limit and/or change animal performance. A shortage of protein in relation to energy can increase the proportion of fat to lean added, especially in younger cattle. Underfeeding protein can cost much more than overfeeding protein due to slow gains and reduced feed efficiency.

Bacteria in the rumen break down protein in feed and use the by-products to build body proteins of high quality. These rumen microorganisms are a low form of plant life and are able to use chemical compounds such as urea (ammonia) just as plants use chemical fertilizers. These bacteria pass on down the digestive tract, are digested and the good quality protein absorbed and utilized like any other protein source. Thus, two protein alternatives are available to the feedlot operator – plant protein and non-protein nitrogen (urea).

The only way to accurately determine the amount of protein supplement required in a ration is to have your feed tested. Use the most economical protein source available that will satisfy requirements, keeping the following in mind.

Natural protein supplements should be fed for the first four to six weeks that cattle are adjusting to the feedlot and the finishing ration. Commonly available natural supplements include canola meal, soybean meal, brewers and distillers grain, and alfalfa pellets. Although some difference in energy exists between these natural supplements, for feedlot cattle the price per kilogram of protein is the primary consideration. To work out the unit price for protein use the following method. Determine the actual number of kilograms of protein in a tonne of feed by multiplying the guaranteed percent protein by 1000 (kg/tonne). Make sure all supplements are compared at the same moisture level. Then determine the cost per kilogram of protein by dividing the cost per tonne by the kilograms of actual protein in that tonne of supplement. For example, if canola meal contains 37% protein, it contains 1,000 x 0.37 = 370 kg of actual crude protein per tonne. If it sells for $125/tonne, the actual cost of the protein is 125 ÷ 370 = 33.8¢/kg. By the same procedure, 44% soybean meal contains 440 kg of protein per tonne. If it sells for $200 per tonne, the actual cost of the protein is 45.5¢/kg. In this example, canola would be the better buy.

Commercial protein supplements normally contain minerals and vitamins in addition to protein and thus cost more than straight protein sources per kilogram of natural protein. Commercial supplements contain either all natural protein, or a combination of natural and non-protein nitrogen sources (e.g. urea). The amount of protein supplied by non-protein nitrogen will be described as protein equivalent. Thus, a 32 (0) protein supplement can be expected to contain 32% protein from natural sources and no urea. A 32 (20) protein supplement contains a total of 32% crude protein, with 20 of the 32 parts of protein being protein equivalent. This means that the animal should be able to use the urea present in the feed to produce 20 parts of actual protein in the rumen. The protein from urea will commonly be described as ECP (estimated crude protein) from NPS (non-protein sources). The price of the supplement decreases as the proportion of protein supplied by urea increases.

Urea is the cheapest way to add protein to the ration and can be used profitably by feedlot operators. Cattle of the proper size consuming adequate energy can produce 2.8 kg of protein in their rumen for every kilogram of urea fed. Urea can be used to supply up to 33% of the total protein requirement of feedlot cattle. Higher levels cause a depression in gain and feed efficiency. Urea is unpalatable and will cause death if not fed properly. Therefore, it is absolutely essential that the proper amounts of urea be completely mixed in the ration. Mixing with a shovel or hammermill is not good enough.

Utilization of urea depends on a high level of energy being present, so it should be used with high grain rations. Urea can be used at up to 1.0% of the ration dry matter for heavy cattle on full feed. Some feedlots restrict urea to 1/2 or 3/4 of 1% to avoid possible overfeeding of urea due to mixing errors. Do not feed urea to new feeder cattle until they are healthy and started on feed. This usually takes four to six weeks. Then introduce the urea gradually for a two to three week period. Make sure the ration is balanced for minerals and vitamins.

Animals under 200 kg (450 lb) gain more efficiently on natural proteins. Calves at 200 to 270 kg (450-600 lb) on a growing ration can make use of some urea provided they receive at least 1.8-2.2 kg (4-5 lb) of grain/head/day. Animals over 270 kg (600 lb) make the most efficient use of urea.

Molasses-urea liquid protein supplements fed free choice are normally not cost competitive with an equivalent source of protein mixed in a ration for feedlot animals.

Minerals

Salt is inexpensive but necessary to maintain appetite and general health. It is usually included at 0.5% of the total ration dry matter, with 0.25% being a minimum. Under normal conditions cobalt-iodized (blue) salt should always be used.

Table 4. Mineral and Vitamin Requirements (Percent of Total Ration Dry Matter or Amount per Kilogram of Total Dry Ration)

Nutrient	Growing and Finishing Steers and Heifers
Vitamin A (IU)	2200
Vitamin D (IU)	275
Vitamin E (IU)	15-60
Minerals	
Sodium (%)	0.06
Calcium (%)	0.18-1.04
Phosphorus (%)	0.18-0.70
Magnesium (%)	0.04-0.10
Potassium (%)	0.6-0.8
Sulphur (%)	0.1
Iodine (mg)	0.05-0.1
Iron (mg)	10
Copper (mg)	5-10
Cobalt (mg)	0.05-0.1
Manganese (mg)	1-10
Zinc (mg)	20-30
Selenium (mg)	0.1

Salt can be mixed with feed in sufficient quantities to limit intake. This is sometimes done to limit grain consumption of animals on pasture. For this purpose, plain white salt must be used.

Calcium and phosphorus must be present in feedlot rations in the proper amounts and proportions to avoid improper bone growth and lameness. There must be more calcium than phosphorus in the total ration. As long as the minimum phosphorus requirement is met, a range of 1.5 to 5 parts calcium for every one part phosphorus is acceptable.

In general, legumes are high in calcium. Grasses and straw contain equal parts of calcium and phosphorus, and cereal grains are low in calcium and high in phosphorus. Therefore, growing rations using legumes as the forage should be supplemented with a mineral containing equal parts of calcium and phosphorus – a 1:1 mineral. The usual mineral supplement used in feedlot growing rations where a legume is not fed is a 2:1 mineral – containing 2 parts calcium to 1 part phosphorus. High grain finishing rations can be very low in calcium. A rule of thumb is to add 1% of a 2:1 mineral and 1% limestone (calcium carbonate) to high grain finishing rations.

If there is reason to believe that trace minerals such as copper, zinc or selenium may be deficient in your herd or area, trace mineralized mineral supplements are available.

Vitamins

Vitamin A should be added to feedlot rations. Vitamin ADE premixes or injections are inexpensive and should be used to supply the total animal requirements. Intramuscular injection of Vitamin A is a common practice when new cattle of unknown background arrive at feedlots. Growing animals require 20,000 to 25,000 international units (I.U.) and finishing animals 30,000 I.U. of Vitamin A per day. Either inject a 60 day supply or incorporate it into the feed. The amount to add to the concentrate will depend on weight of concentrate fed per day.

Water

Water is the most important nutrient for the animal's immediate survival and well-being. An adequate supply of good quality water is absolutely essential. Consumption varies with the size of animal, type of feed and weather. Average consumption ranges from 10 to 15 L per 100 kg of body weight (1.0-1.5 gal/100 lb). Therefore, a 450 kg (1,000 lb) steer will consume 45-70 L (10-15 gal) per day, and more if the weather is hot. Poor quality water can result in poor performance and even death.

If water quality is doubtful, consult your agricultural representative about testing procedures. A qualified nutritionist should interpret the laboratory results, as results may call for adjustments to the ration if the water is used.

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The only accurate method of determining the nutrient content of feedstuffs is to have them analyzed. The basic analysis of forages includes dry matter,

Table 5. Nutrient Requirements for Growing Finishing Steer Calves and Yearlings (Nutrient Concentration in Ration Dry Matter)

Weight		Daily Gain		Minimum Dry Matter Consumption		Roughage	Total Protein	TDN	Ca	P
(kg)	(lb)	(kg)	(lb)	(kg)	(lb)	(%)	(%)	(%)	(%)	(%)
100	220	0	0	2.1	4.6	100	8.7	55	0.18	0.18
		0.5	1.1	2.9	6.4	70-80	12.4	62	0.48	0.38
		0.7	1.5	2.7	6.0	50-60	14.8	70	0.70	0.48
		0.9	2.0	2.8	6.2	25-30	16.4	77	0.86	0.57
		1.1	2.4	2.7	6.0	<15	18.2	86	1.04	0.70
150	331	0	0	2.8	6.2	100	8.7	55	0.18	0.18
		0.5	1.1	4.0	8.8	70-80	11.0	62	0.35	0.32
		0.7	1.5	3.9	8.6	50-60	12.6	70	0.46	0.36
		0.9	2.0	3.8	8.4	25-30	14.1	77	0.61	0.45
		1.1	2.4	3.7	8.2	<15	15.6	86	0.76	0.54
200	441	0	0	3.5	7.7	100	8.5	55	0.18	0.18
		0.5	1.1	5.8	12.8	80-90	9.9	58	0.24	0.22
		0.7	1.5	5.7	12.6	70-80	10.8	64	0.32	0.28
		0.9	2.0	4.9	10.8	35-45	12.3	75	0.47	0.37
		1.1	2.4	4.6	10.1	<15	13.6	86	0.59	0.43
250	551	0	0	4.1	9.7	100	8.5	55	0.18	0.18
		0.7	1.5	5.8	12.8	55-65	10.7	70	0.31	0.28
		0.9	2.0	6.2	13.7	45-50	11.1	72	0.35	0.31
		1.1	2.4	6.0	13.2	20-25	12.1	77	0.43	0.35
		1.3	2.9	6.0	13.2	<15	12.7	86	0.50	0.38
300	661	0	0	4.7	10.4	100	8.6	55	0.18	0.18
		0.9	2.0	8.1	17.9	55-65	10.0	70	0.27	0.23
		1.1	2.4	7.6	16.8	20-25	10.8	77	0.33	0.29
		1.3	2.9	7.1	15.6	<15	11.7	83	0.41	0.32
		1.4	3.1	7.3	16.1	<15	11.9	86	0.42	0.34
350	772	0	0	5.3	11.7	100	8.5	55	0.18	0.18
		0.9	2.0	8.0	17.6	45-55	10.0	72	0.25	0.22
		1.1	2.4	8.0	17.6	20-25	10.4	80	0.29	0.25
		1.3	2.9	8.0	17.6	<15	10.8	83	0.32	0.28
		1.4	3.1	8.2	18.1	<15	10.9	86	0.34	0.29
400	882	0	0	5.9	13.0	100	8.5	55	0.18	0.18
		1.0	2.2	9.4	20.7	45-55	9.4	72	0.22	0.21
		1.2	2.6	8.5	18.7	20-25	10.2	80	0.27	0.25
		1.3	2.9	8.6	19.0	<15	10.4	86	0.29	0.26
		1.4	3.1	9.0	19.8	<15	10.5	86	0.29	0.26
450	992	0	0	6.4	14.1	100	8.5	55	0.18	0.18
		1.0	2.2	10.3	22.7	45-55	9.3	72	0.19	0.19
		1.2	2.6	10.2	22.5	20-25	9.5	80	0.23	0.22
		1.3	2.9	9.3	20.5	<15	10.4	86	0.26	0.25
		1.4	3.1	9.8	21.6	<15	10.0	86	0.26	0.23
500	1,102	0	0	7.0	15.4	100	8.5	55	0.18	0.18
		0.9	2.0	10.5	23.1	45-55	9.1	72	0.18	0.18
		1.1	2.4	10.4	22.9	20-25	9.2	80	0.19	0.19
		1.2	2.6	9.6	21.2	<15	10.0	86	0.22	0.22
		1.3	2.9	10.0	22.0	<15	9.7	86	0.22	0.22

Table 6. Nutrient Requirements for Growing Finishing Heifer Calves and Yearlings (Nutrient Concentration in Ration Dry Matter)

Weight		Daily Gain		Minimum Dry Matter Consumption		Roughage	Total Protein	TDN	Ca	P
(kg)	(lb)	(kg)	(lb)	(kg)	(lb)	(%)	(%)	(%)	(%)	(%)
100	220	0	0	2.1	4.6	100	8.7	55	0.18	0.18
		0.5	1.1	3.0	6.6	70-80	12.4	61	0.47	0.37
		0.7	1.5	2.9	6.4	50-60	14.4	69	0.66	0.48
		0.9	2.0	3.0	6.6	25-30	15.9	77	0.80	0.57
		1.1	2.4	3.0	6.6	<15	17.8	86	0.97	0.63
150	331	0	0	2.8	6.2	100	8.7	55	0.18	0.18
		0.5	1.1	4.1	9.0	70-80	11.0	61	0.34	0.29
		0.7	1.5	4.0	8.8	50-60	12.4	69	0.45	0.35
		0.9	2.0	4.0	8.8	25-30	13.5	77	0.57	0.42
		1.1	2.4	4.0	8.8	<15	15.0	86	0.70	0.50
200	441	0	0	3.5	7.7	100	8.5	55	0.18	0.18
		0.3	0.7	5.4	11.9	100	9.1	55	0.18	0.18
		0.5	1.1	6.0	13.2	80-90	9.6	58	0.23	0.22
		0.7	1.5	6.0	13.2	70-80	10.2	64	0.30	0.27
		0.9	2.0	5.3	11.7	35-45	11.7	75	0.41	0.32
		1.1	2.4	5.0	11.0	<15	12.8	86	0.50	0.38
250	551	0	0	4.1	9.0	100	8.5	55	0.18	0.18
		0.3	0.7	6.4	14.1	100	8.9	55	0.18	0.18
		0.5	1.1	6.5	14.3	80-90	9.5	58	0.20	0.20
		0.7	1.5	5.8	12.8	55-65	10.5	72	0.29	0.26
		0.9	2.0	5.9	13.0	35-45	11.1	77	0.36	0.29
		1.1	2.4	6.5	14.3	20-25	11.4	80	0.38	0.31
		1.2	2.6	6.3	13.9	<15	11.9	86	0.43	0.33
300	661	0	0	4.7	10.4	100	8.6	55	0.18	0.18
		0.3	0.7	7.4	16.3	100	8.5	55	0.18	0.18
		0.5	1.1	7.4	16.3	80-90	9.2	61	0.19	0.19
		0.7	1.5	6.6	14.6	55-65	10.1	72	0.24	0.23
		0.9	2.0	6.8	15.0	35-45	10.4	77	0.28	0.25
		1.1	2.4	7.5	16.5	20-25	10.4	80	0.31	0.27
		1.2	2.6	7.2	15.9	<15	10.9	86	0.33	0.28
350	772	0	0	5.3	11.7	100	8.5	55	0.18	0.18
		0.3	0.7	8.2	18.1	100	8.5	55	0.18	0.18
		0.5	1.1	8.3	18.3	80-90	8.7	61	0.19	0.18
		0.7	1.5	7.9	17.4	55-65	9.2	69	0.19	0.19
		0.9	2.0	8.1	17.9	35-45	9.5	75	0.21	0.21
		1.1	2.4	8.3	18.3	20-25	9.9	80	0.24	0.23
		1.2	2.6	8.1	17.9	<15	10.0	86	0.26	0.25
400	882	0	0	5.9	13.0	100	8.5	55	0.18	0.18
		0.3	0.7	9.1	20.0	100	8.5	55	0.18	0.18
		0.5	1.1	8.5	18.7	70-80	8.8	64	0.18	0.18
		0.7	1.5	8.7	19.2	55-65	9.0	66	0.18	0.18
		0.9	2.0	8.4	18.5	20-25	9.4	77	0.20	0.20
		1.1	2.4	8.3	18.3	<15	9.7	86	0.23	0.22
450	992	0	0	6.4	14.1	100	8.5	55	0.18	0.18
		0.2	0.4	8.7	19.2	100	8.5	55	0.18	0.18
		0.5	1.1	9.3	20.5	70-80	8.6	64	0.18	0.18
		0.8	1.8	9.1	20.1	35-45	9.0	75	0.18	0.18
		1.0	2.2	8.5	18.7	<15	9.5	86	0.22	0.22

crude protein, crude fiber, calcium and phosphorus and an estimate of energy content (TDN).

An analysis of complete mixed feeds includes dry matter, protein, calcium and phosphorus. An energy estimate for complete feeds is included only if the ration ingredients and amounts are specified. Analysis of whole grains includes dry matter, protein, bushel weight and an energy estimate. The accuracy and usefulness of a feed test depends entirely on the sample being representative of the total supply. In addition to feed analysis, the service provided by Manitoba Agriculture includes, for those who wish to make use of it, ration formulation and adjustment by a qualified nutritionist. To take advantage of this service detailed information on the animals and the rations must be provided. Check with your agricultural representative for details. Send feed samples to:

Feed Analysis Laboratory
Agricultural Services Complex
University of Manitoba Campus
545 University Crescent
Winnipeg, Manitoba
R3T 2N2

Feed testing has three major functions:

- It ensures that rations can be formulated for maximum use of the nutrients present in the feed.
- It serves as a quality control on home mixed rations, to be sure the ration on paper is the same as the finished product.
- It identifies nutrient levels in existing rations.

Use of average analysis in ration formulation results in over or under supplying of essential nutrients. In either case, the error is costly.

Calculating Balanced Rations

There are several ways to calculate balanced rations. The method referred to as the Pearson Square is easy to understand, uses simple calculations and is used by all nutritionists. The Pearson Square can be used to determine the mix of feedstuffs needed to supply the required energy, protein, or any nutrient. It also allows for easy substitution if prices or supplies of ingredients change.

The steps in using the Pearson Square are:

1. Draw a square and place the percent protein of the two feed ingredients (barley 10%, canola meal 37%) in the two left corners of the square. (If, for example, two or more grains are being used, average out the protein for the grains and use that figure).

2. Place the desired protein level of the ration (in this case 12%) in the middle. This value must fall between the protein percentage of the nutrients supplied by each of the feedstuffs.

3. Record the difference between the desired level and each of the ingredients in the diagonally opposite right hand corners of the square (subtract along the arrows to get the answer at the head of the arrows).

   In the example given these differences represent the proportion of barley and canola meal (25 parts barley and 2 parts canola meal) which when mixed will give 12% protein. The total parts will be 25 + 2 = 27.

4. To make a one tonne (1,000 kg) mix, each figure is multiplied by 1,000 and divided by 27 (the total parts in the mix). Our result is that 74 kg of canola meal and 926 kg of barley are needed to provide one tonne of mix containing 12% protein. Always check to see if the other nutrients are present in sufficient quantities.

Accurate Mixing

The best way to mix rations accurately in vertical mixers is to weigh each ingredient before or while loading into the mixer. If your mixer is equipped with scales, this is a fairly simple procedure. Many mixers do not have scales, however, so an alternate method is needed. One method is to use a pail to measure the grain into the mixer and count the pailfuls while filling. An average weight of grain must be determined by weighing several pailfuls of each grain type. For example a 20 litre pailful of barley might weigh about 14 kg and oats about 10 kg. A desired growing ration might be made up of 30% oats, 30% barley, 30% straw and 10% supplement. An average straw bale might be about 20 kg and the supplement would likely be purchased in 25 kg bags.

The mixer volume needs to be determined before starting to make a batch. Volumes are usually given in cubic metres (m^3) and/or U.S. volume bushels. If the volume is given only in U.S. bushels, multiply by 0.035 to get cubic metres. A typical high roughage ration will weigh about 150-300 kg/m^3 and a grain ration may be from 300-500 kg/m^3. With a mixer volume of 3.5 m^3 and the above ration (assume 300 kg/m^3) the mixer would hold about 3.5 x 300 = 1050 kg. You might want to try a smaller batch at first to make sure that there is room for all the ingredients.

Assuming the above proportions and weights, calculate the amounts needed as follows for a 1000 kg batch:

barley 30% x 1000 = 300 kg
÷ 14 kg/pail = 21 pails

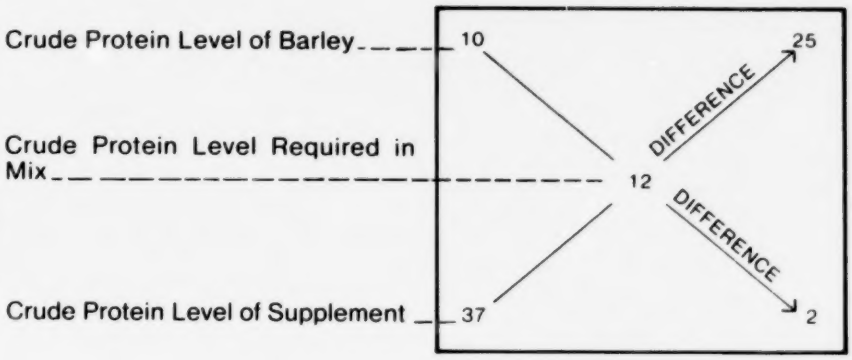
oats 30% x 1000 = 300 kg
÷ 10 kg/pail = 30 pails

straw 30% x 1000 = 300 kg
÷ 20 kg/bale = 15 bales

supplement 10% x 1000 = 100 kg
÷ 25 kg/bag = 4 bags

The Pearson Square:

Your barley tests 10% crude protein and you are mixing 37% canola meal with the barley. You want to balance the ration at 12% crude protein.



25 Parts Barley x 1000 / 27 Total Parts = 926 kg

2 Parts Supplement x 1000 / 27 Total Parts = 74 kg

27 Parts Total 1,000 kg

Result: To balance one tonne of barley and supplement to the 12% crude protein level, you must use 926 kg barley for every 74 kg of supplement.

To check the amount of protein in the ration:

926 kg barley (10% CP) supplies $\frac{926 \times 10}{100}$ = 92.6 kg protein

74 kg supplement (37% CP) supplies $\frac{74 \times 37}{100}$ = 27.4 kg protein

Total protein in 1 tonne of ration (12%) = 120.0 kg protein

1 tonne = 1,000 kg

Note: The level of other nutrients can be checked in the same manner.

Vertical mixers should be operated for two to five minutes after all ingredients are added. Overmixing of high roughage rations can cause settling out of the higher density ingredients.

The volume of grain increases by about 1/3 when ground or rolled. Typical ground densities for wheat are 500-600 kg/m^3, barley 450-500 kg/m^3, and oats 325-375 kg/m^3. If weighing and handfilling of the mixers is impractical, the above values can be used to proportion the grain on a volume basis.

A small auger can be used instead of pails by weighing the amount of each grain that the auger moves in one minute. Work out how many minutes it takes to get the total weight of grain required. Then mark off the levels in the tank as with the previous method.

Calibrating the tank for each separate ration may seem to be too time consuming. However, errors in mixing can quickly waste any potential profits from feeding since feed makes up such a high percentage of the total costs.

If you feed roughage free choice and hand feed grain for certain classes of animals, you need to have an idea of their total daily feed consumption. Average feed consumption on an air dry basis ranges from 3.0% to 3.5% of body weight for calves in the 185-270 kg (400-600 lb) range to around 2.5% for 455-500 kg (1,000-1,100 lb) steers at the end of the finishing period. Therefore, 200 kg (440 lb) steers will consume around 0.03 x 200 = 6 kg of feed per day. Steers in the late stages of finishing on self-fed grain with low-quality roughage free choice will consume 20% to 30% of their daily intake as roughage. After you estimate roughage consumption you can figure out with reasonable accuracy how much supplement to add to the grain to make up for any lack of nutrients in the forage.

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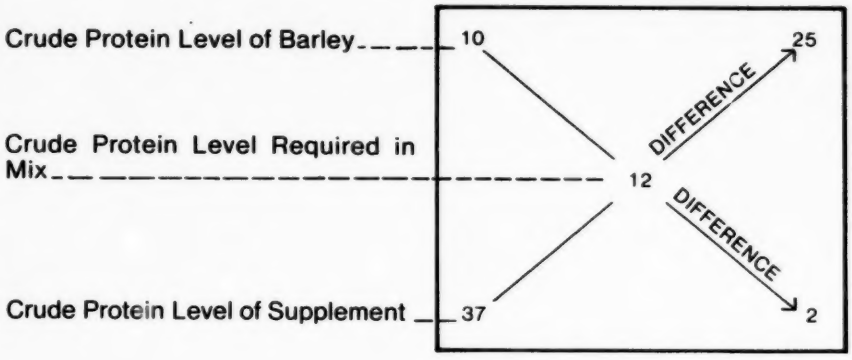

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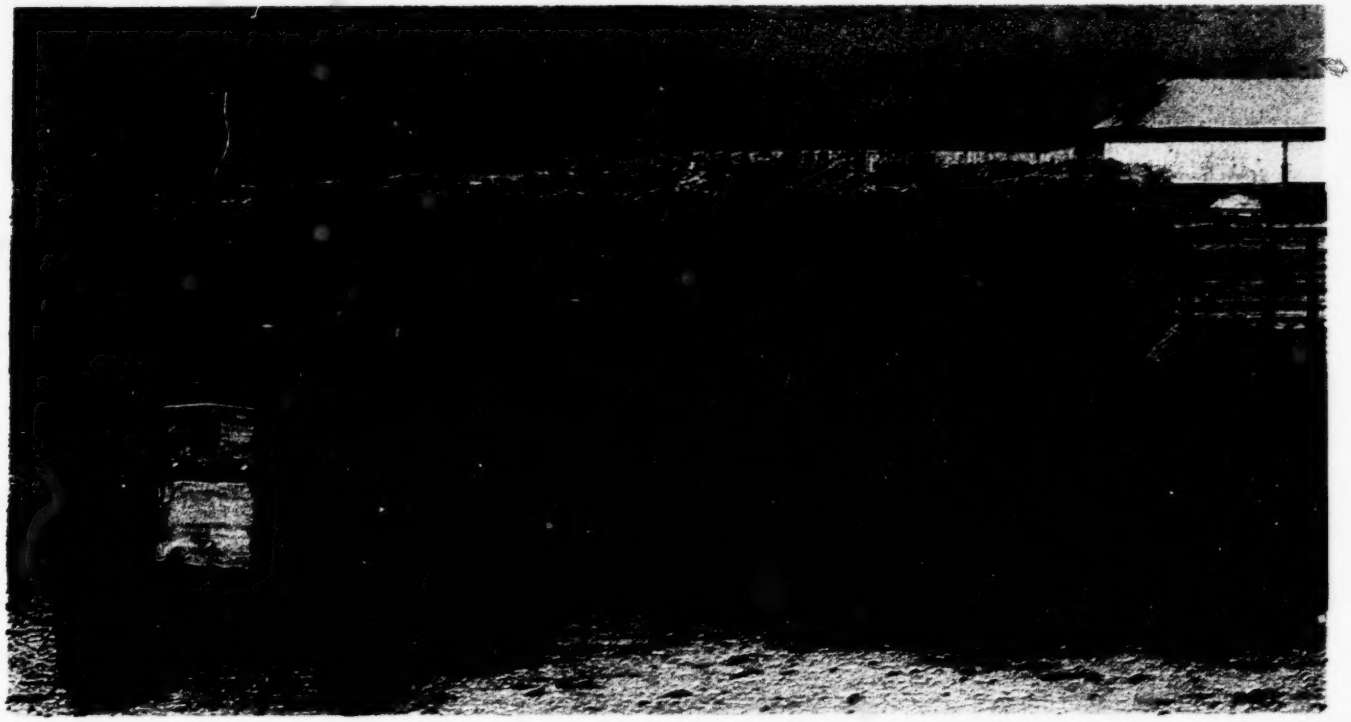

Accurate mixing makes the most of all ration ingredients.

A mixed feed should be uniform in makeup. Unfortunately, ration ingredients will separate out in a vertical grinder-mixer if they are mixed too long. Sorting occurs according to particle size and weight. Ingredients which are added in small amounts such as vitamins should be mixed with one or two pails of grain before being added to the mixer so they become evenly distributed in the mix.

The best way to mix a ration in a vertical grinder-mixer is to:

1. Add half the grain.
2. Add the supplement.
3. Add the rest of the grain.
4. Add the roughage.
5. Mix for five minutes – preferably at the unloading site to eliminate shaking out of the load during travel.

Note: The feed that is discharged in the first 15 seconds from the mixer may contain up to six times more supplement than the rest of the ration. If potentially harmful ingredients such as urea are used, make sure there is feed in the trough beforehand and spread the initial discharge out along the trough. If that's not possible add the initial discharge back into the mixer.

Feed Processing

The processing of roughage or grain can improve their feeding value. This is due to:

- Increased digestibility. By cracking the seed coat of grains, rumen microorganisms and digestive enzymes have a greater surface area to work on and thus easier access to the starch and other nutrients.
- Increased palatability and consumption. This can improve animal performance by changing the rate of passage of feed. This in turn allows more total feed to be eaten.
- Reduced sorting and wastage. A total mixed ration reduces sorting, forces animals to consume relatively unpalatable ration ingredients, may be used to limit concentrate consumption and enables easy changes in ration.
- Changes in the end products of digestion in the rumen.

Processing grain on the farm is usually limited to grinding, hammering or rolling. The main thing to remember is to keep the end product as coarse as possible. It's much better to have a few whole kernels, which will be partly digested, than to have too many fines which reduce consumption and are a major reason for bloat.

One practical way of reducing fines is to temper the grain by adding water to it before processing. This increases the average particle size. Tempering can be accomplished by using a simple spray system to add water into an auger. Placing a garden hose into the auger, about 3 m (10 ft) from the top, when the auger is at full throttle has been used successfully. Allow the moistened grain to stand for a few hours in warm weather or overnight in cold weather before processing. Tempering is impractical in very cold weather.

Processing can increase the feeding value of grain by 5% to 15%. The disadvantage is the cost of owning and operating the equipment.

The improvement in feed value of forages by processing depends to some extent on the quality of the forage. Processing high quality forage has little effect except to reduce waste. Processing low quality forages increases rate of passage, total consumption and performance.

Roughages should be coarsely chopped. Grind them through a minimum 2.5 cm (1 inch) screen for complete mixed rations. If you feed in a self-feeder, a slightly smaller screen may be necessary to prevent bridging. Small sized screens increase fuel consumption and put more dust into the ration.

There are several types of mills available for processing feed. These include:

(1) Hammer mill
- least uniform grind
- high power requirement
- repairs and upkeep low
- large percentage of fines
- large amount of dust
- will handle roughage

(2) Burr mill
- medium uniformity
- medium power requirement
- low initial cost
- higher maintenance cost
- requires more adjustment

(3) Roller mill
- most uniform feed
- lowest power requirement
- maintenance costs can be high
- least dust
- greater palatability than ground or hammered feed

(4) Steam roller
- increased digestion over dry-rolled grain is usually not enough to offset cost

Warning: Every mill should be equipped with magnetic separators in order to reduce wear and tear on equipment and, more important, to virtually eliminate hardware disease.

Feedlot Respiratory Diseases

Numerous studies have shown that respiratory disease is caused by a combination of stress plus viral and bacterial infections, usually involving more than one disease organism.

The significant stress factors are: fatigue, hunger, thirst, dust, anxiety, ammonia build up, adverse weather, weaning, shipping and mixing with other cattle.

In most cases, feedlot respiratory diseases are caused by an overlapping of two or more diseases. The term Bovine Respiratory Disease is understandably replacing such names as Shipping Fever since it encompasses most feedlot respiratory diseases. Significant respiratory diseases of feedlot cattle are I.B.R., Pasteurella Pneumonia, Atypical Interstitial Pneumonia and Necrotic Laryngitis.

Infectious Bovine Rhinotracheitis (I.B.R. or Red Nose): The name indicates an inflammation of the upper respiratory tract, and this is the most common form of the disease in feedlot cattle. However, it can manifest itself in many different forms.

The disease is caused by a virus and is spread by contact with infected animals, usually through coughing and sneezing. Animals that recover from I.B.R. may become carriers of the disease and are capable of infecting other animals for a year or longer.

Affected feedlot cattle go off feed, have a high fever, harsh cough, watery eyes, inflamed nostrils and eyelids, and a nasal discharge. The discharge is at first clear but becomes cloudy with mucous as the disease progresses. Later, cattle may become very depressed, with difficult breathing and dry crusted muzzles. The disease is often complicated by secondary infections such as pneumonia.

Treatment is aimed at controlling secondary infections, since antibiotics have little effect on viruses.

I.B.R. can be prevented to a great extent by a vaccination program tailored to suit your particular circumstances through consultation with your veterinarian.

Pasteurella Pneumonia: Sometimes called shipping fever, this respiratory disease is believed to be caused by Pasteurella bacteria. These natural inhabitants of the nasal passage usually cause no harm because they are kept in check by the body's normal defence mechanisms. Stress, caused either physically or by viral infections, lowers the natural defences and Pasteurella bacteria multiply rapidly, invade the lungs and cause a severe pneumonia. Affected animals go off feed, are depressed, and have a fever (40-42°C), cough, nasal discharge and rapid and difficult respiration. There may be diarrhea, knuckling of the fetlocks and some degree of bloat. The outcome of the disease varies and affected animals may die, suffer from chronic pneumonia, or recover with or without treatment.

Early detection and treatment are essential. Cattle usually respond to most of the common antibiotics given early in the course of the disease. A combination of drugs may be more effective than a single drug. Since not all drugs can be safely mixed with each other, any combination should be approved by your veterinarian before use. Preventive injections of antibiotics or mass medication through the drinking water may be advised by the veterinarian if more than 10% of a group of animals are affected at one time.

Satisfactory Pasteurella vaccines have not yet been developed. Prevention and control are based on sound management principles, particularly in regard to avoiding stress.

Atypical Interstitial Pneumonia (Acute Bovine Pulmonary Emphysema): As the name suggests, this is a

pneumonia-like condition with symptoms that are not typical of most pneumonias. It is thought to be primarily an allergic reaction to moulds, dusts, pollens, lung worm larvae or particular feedstuffs. It is often associated with sudden changes in diet such as a change from dry to lush green pasture.

The disease is characterized by the sudden onset of acute respiratory distress. Affected animals will gasp for air (mouth breathing), froth at the mouth, and often grunt as they breathe out. Attempts to move affected animals will only make the condition worse. Death may occur within hours or days or weeks. There may be periods of partial recovery followed by relapses. Except in mild cases, complete recovery seldom occurs.

The slaughter of severe cases should be considered before treatment is started. When cases of A.I.P. occur attempt to remove the cause of the problem. Antibiotics may be used to prevent secondary bacterial infections. The use of antihistamines and corticosteroids is often recommended but the benefits are questionable.

Avoid dusty feeds and sudden changes in diets. The feed additive, monensin, appears to be effective in controlling A.I.P.

Necrotic Laringitis (Wheezers): This disease affects the voicebox and is characterized by loud wheezing as the animal breathes which progresses to labored breathing and loss of condition. Response to antibiotic treatment is often dramatic at first but relapses accompanied by slow overall recovery are common. Treatment is often unsuccessful. Treatment should be continued for seven days to minimize the likelihood of the disease recurring.

Just as controversy surrounds the issue of when to process incoming cattle, feedlot operators frequently argue about the merits of preventive medication for respiratory diseases.

Some feeders like to medicate the drinking water with antibiotics or sulfa preparations for the first few days following arrival of the cattle. Others prefer to feed antibiotics at low levels in the feed for the first two to three weeks. Some like to inject calves with a single large dose of antibiotic, three to four days after arrival. Still others prefer to watch the cattle closely and give medication only to sick animals. All can back their claims for the best method by citing successful instances when their particular treatment worked.

One of the reasons preventive medication does not always work is that the many organisms which cause respiratory disease have different incubation periods. This is the time between the implanting of an infectious disease and the appearance of clinical signs. Unless one is prepared to medicate for a long time, which may not be economically feasible, feedlot operators cannot hope to prevent all respiratory disease. Another reason is that different disease organisms respond to different medications and some, like viruses, do not respond to any. Specific recommendations can only be made for individual feedlots.

Feedlot Digestive Diseases

The same basic principles involved in controlling feedlot respiratory diseases apply to the prevention and control of digestive problems. The best practice is to minimize stress and enable the animals to quickly adapt to their new environment.

The single most important factor is to keep the cattle from going off feed, and to get those that do go off feed eating again as soon as possible. When calves stop eating for 48 hours, four very important things happen:

- fermentation in the rumen drops to 10% or 15% of normal.
- the protozoal population of the rumen is often reduced to zero.
- the bacterial population of the rumen is reduced to 10% to 25% of normal.
- the balance between microbial species is disrupted by differential death loss.

The bacteria and protozoa are responsible for the major breakdown of the feed in the rumen and the release of energy in the form of volatile fatty acids. Protozoa reduce the rate of starch digestion. Reductions in the bacterial and protozoal population cause a loss of energy and protein and a rapid change in rumen pH. In addition, there is a loss of B vitamins which are synthesized by bacteria in the rumen. Since B vitamins are not stored in the body (as Vitamin A is in the liver) a deficiency rapidly develops. The B vitamins appear to be important in the development of immunity to infectious diseases.

It takes three to four days after the calves start to eat again for the bacterial and protozoal populations to be restored to normal.

The bacteria and protozoa in the rumen are able to adjust to the type of feed that an animal is eating. If the ration is mainly hay with little grain, the population will consist mostly of organisms that digest hay. When the proportion of grain to hay is changed, the bacterial population changes accordingly. It must be realized that it takes time for these bacterial populations to change and therefore any change in feed rations should be made gradually.

Rumen Overload

Rumen overload generally results from cattle consuming large amounts of grain before changes have occurred in the rumen's bacterial population, to enable the animal to handle such large amounts. Fermentation occurs rapidly (particularly if the animals have immediate access to water) and the rumen contents become very acidic.

In mild cases, animals may be off feed, stand apart from the rest of

the animals and have a fluid diarrhea.

Moderate cases may look full or bloated, be weak and staggery and, because of the diarrhea and acid contents of the rumen, become dehydrated.

In severe cases, animals may be down, comatose, and cold – in a toxic condition which progresses to death.

Treatment aims at correcting the acidic condition and restoring the bacterial population in the rumen, rehydrating the animal and restoring feed intake. In some cases, an early decision to ship affected animals may be the best move. If the animals are noticed soon after consuming large amounts of grain and before they drink water, severe problems may be avoided by keeping them away from water for up to 24 hours. This prevents rapid fermentation of the grain. Common treatments are anti-acids and laxatives.

To prevent rumen overload:

- Fill new cattle with hay for the first 12 to 24 hours in the feedlot.
- Use starter rations with more than 50% roughage.
- Practice good feedbunk management.
- Add buffers such as 1% baking soda to the ration.

Bloat

Bloat occurs when gas is produced in the rumen faster than the animal can belch it off or when the belching is impeded by an obstruction in the esophagus or by rumen paralysis. There are two types of bloat:

- Free gas bloat; where gas collects in the upper portion of the rumen.
- Frothy bloat; where gas is trapped in foam inside the rumen.

Usually bloat occurs rapidly. There is pronounced abdominal swelling, particularly on the left side. The animal is uneasy and urinates and defecates frequently. Occasionally, the condition becomes chronic.

To treat bloat the gas is released by passing a stomach tube into the rumen or by puncturing the left side of the animal with a large needle or trocar. Mineral oil is usually given to prevent further fermentation and gas production and to speed the passage of the offending feedstuff through the digestive tract. Veterinarians often add preparations to the mineral oil to speed-up its action. Animals with frothy bloat are often given a surfactant such as "dioctyl sodium sulfosuccinate" to dispel the foam.

The following steps can be taken to prevent bloat:

- Avoid finely ground feeds.
- Check the Ca:P ratio of the mineral mix. If alfalfa is fed, the ratio should be 1:1. If straw is fed instead of alfalfa, the ratio should be 2:1.
- Don't let cattle run out of feed.
- Avoid certain feed combinations which seem to cause bloat, such as 50:50 barley-alfalfa.
- Add 2% to 4% fat to the ration.
- If the grain has less than 12% moisture, it may be necessary to add water to it before processing.
- If cattle are fed only once a day, try feeding the same amount in two or three feedings.
- Be sure the cattle have adequate feeder space. Practice good feedbunk management.

Liver Abscesses

These are usually noted at slaughter and are responsible for the condemnation of many livers. They occasionally result in the sudden death of an animal and may cause a slight reduction in the performance of live animals.

Prevent mild grain overloads and practice good feedbunk management to reduce liver abscesses. Continuous use of low level antibiotics in the feed is sometimes recommended when the incidence of liver abscesses is unusually high.

Coccidiosis

Coccidiosis is indicated by blood stained rear ends, straining and bloody diarrhea. It is an infection of the hind gut by microscopic parasites called coccidia. Oocysts (eggs) are passed in the diarrhea which may contaminate feed and water ingested by other animals and cause them to be infected. The disease usually affects feedlot animals or young calves on poorly drained pastures. In an uncommon form of the disease, convulsions occur, with or without bloody diarrhea.

Sulfamethazine or Amprolium, given orally, are standard treatments. Monensin in the feed may help to control the disease, as will preventing contamination of feed and water. Avoid sudden stresses. The disease often appears following a sudden cold spell.

Bovine Virus Diarrhea (B.V.D.)

B.V.D. is an infectious disease that may go unnoticed in a herd or show up as one or a combination of several clinical signs. It is probably more widespread than is generally realized.

It is usually transmitted in feeds contaminated by manure and urine. Animals may shed the virus in their urine for several months after they recover from the disease.

B.V.D. affects animals from six months to two years of age. Clinical signs vary from the mild form with diarrhea and fever and quick recovery to extreme sores in the mouth, with or without diarrhea. There may be lameness and eye lesions. In the severe form, mortality may be high and survivors may remain unthrifty. The disease also causes abortions, weak newborn calves and birth defects.

Treatment is limited to the control of secondary infections.

In addition to good sanitation and isolating infected animals, vaccines are available to help control the disease. Vaccination is not advised without prior consultation with your veterinarian.

Other Feedlot Diseases

Urinary Calculi (Water Belly)

The primary cause of urinary calculi is thought to be a high level of silicates in the feed, particularly in the roughage. Small stones or calculi form in the penis or bladder, impeding the passage of urine. An incorrect Ca:P ratio or Vitamin A deficiency may contribute to the condition.

The animal shows signs of discomfort while urinating, by straining and tail swishing, stretching and stamping his hind feet. When the passage of urine is completely stopped, the penis may rupture, causing a large swelling under the belly as the urine collects. If the bladder ruptures, the urine collects in the abdomen and the condition may be confused with bloat.

Medications are available to relax the urethral muscles and allow the passage of the stone which may be helpful in very early cases, but the majority of cases require surgical correction.

To prevent urinary calculi:

- Balance the mineral intake by keeping Ca between 0.4% and 0.6% of the ration and P between 0.25% and 0.3%. Keep the Ca:P ratio between 1:1 to 2:1.
- Provide adequate Vitamin A: 1-1.5 million units on arrival, plus 30,000 I.U. in the feed daily.
- Late castration gives a larger diameter to the urethra.
- Encourage water consumption by adding 1/2 of 1% salt to the ration and/or by heating the water in winter.
- Add ammonium sulfate or chloride to the ration.
- If possible, keep calves intended for the feedlot off pastures with known high silicate content. Native pastures are the worst in this regard.

I.T.E.M.E. (Infectious Thromboembolic Meningoencephalitis)

Sometimes called "Sleeper Syndrome", this disease is caused by a bacteria (Hemophilus somnus). It infects feedlot cattle from one to 10 months of age in mid-winter. The death rate can be high.

Mature animals are thought to be carriers of the disease, which is spread by the respiratory route.

There are three major syndromes. The respiratory syndrome is characterized by a fever, coughing and pneumonia and may run a course of several days. The joint lameness form is marked by swelling of the joints, stiffness and lameness. The most common form is the acute nervous form and is characterized by weakness and incoordination followed by recumbency and paralysis. The course of the disease is usually short in this form; death often occurs within 12 to 18 hours.

Immediate treatment with antibiotics in the early stages of the disease may be worthwhile but, in many cases, the disease is too advanced for successful treatment. Mass medication of the feed or water may be recommended by the veterinarian if more than one or two cases occur.

It is difficult to recommend specific preventive measures since the conditions which favor outbreaks of I.T.E.M.E. are not completely understood. Constant surveillence and early treatment are probably the best measures. A vaccine against the disease is available and widely used, often with variable results.

Polioencephalomalacia (Polio)

Bovine polio is an acute nervous disease in which there is swelling and deterioration of the brain. Affecting mostly feedlot cattle on high concentrate rations, it is occasionally seen in cattle on pasture.

An acute thiamine deficiency is generally considered to be the cause of this disease, but the mechanisms of the deficiency and the conditions under which it occurs have not been clearly demonstrated.

The disease occurs sporadically and suddenly. Nervous signs include blindness and headpressing, muscle tremors of the head and chomping (munching) of the jaws. These may be followed by recumbency and paddling legs. Milder cases may show blindness and headpressing and remain standing for several hours or a few days. Older cattle are more likely to recover from the disease than calves six to nine months old.

Treatment with thiamine, injected intravenously, is often successful in the early stages of the disease. Many cattle recover completely following treatment. Some recover only partially and are better salvaged through slaughter.

Since the cause of the disease is not clear, neither are the recommendations for its prevention. Providing sufficient roughage in the diet and adding thiamine to the ration appear to be the most practical recommendations.

It is difficult to distinguish between I.T.E.M.E., polio and other nervous diseases. There is also the danger of the disease being rabies. Since early, correct treatment is necessary for any chance of recovery, it is essential that a veterinarian be called immediately whenever an animal exhibits nervous signs. Bovine polio is not related to polio in humans.

Lump Jaw

Lump Jaw is caused by the bacterium Actinomyces bovis which invades wounds in the mouth and gums. The condition appears as a hard, bony, painless lump usually on the lower jaw. It may erupt and discharge a little, only to heal and erupt later at a different site on the lump. If allowed to progress too far, it interferes with the animal's eating. Except for possible antibiotic treatment of early cases in purebred animals, slaughter is the most practical treatment.

Avoid feed containing barley awns, spear grass, etc. Dispose of animals with discharging lesions, as they are sources of infection. Organic iodides in feed or salt may help reduce the incidence of the disease.

Wooden Tongue

The bacterium that causes wooden tongue belongs to the same family of organisms and gains access to the tissues in the same way as the one that causes lump jaw.

It shows up as a swollen, hard tongue, sometimes protruding from the mouth, often with red spots on the surface, that causes slobbering and difficulty in eating.

Unlike lump jaw, this disease usually responds very well to treatment. Sodium iodide given intravenously is the drug of choice. Injectable antibiotics and sulphonamides will also produce a good response.

It is controlled in the same way as lump jaw.

Foot Rot

Foot rot affects cattle year round. It can be a particular problem in feedlots where wet, muddy conditions prevail. Fusiformis necrophorus bacteria in the soil invade cuts and scratches of the foot, causing a swelling with a foul smelling discharge between the claws.

Sudden, marked lameness characterizes the disease. The lesion may be between the toes, at the back, front or side of the foot.

If given early enough, antibiotics usually result in rapid recovery. If treatment is delayed, permanent lameness may result. Penicillin is usually the drug of choice. The foot should be examined to make sure the lameness is due to foot rot and not a foreign object, such as a nail, or some other injury or infection.

To prevent foot rot try to avoid foot injuries by providing a dry footing, especially around feeders, waterers and any place where cattle congregate. Dihydroiodides in feed or salt and the use of copper sulfate footbaths are other control measures. Low levels of tetracyclines in the feed are sometimes used with feedlot cattle.

Recent research indicates that zinc may play a role in foot rot prevention.

Warbles (Cattle Grubs)

Adult "warble flies", "bomb flies", or "heel flies'. do not bite or sting, but their attempts to attach eggs to the hairs of cattle often cause animals to run wildly. The larvae or grubs appear as lumps in the backs of cattle from February to May, where they damage the meat and cut holes in the hide. The health of the animals may be affected, and cattle may lose some weight.

The eggs are laid on the hair of the hind legs of cattle. They hatch in about four days, penetrate the skin and travel through subcutaneous tissue, reaching the esophageal region by late fall. During winter they travel towards the back and in late winter become noticeable as lumps under the skin. In spring the grubs emerge through holes in the skin and drop to the ground. They then undergo a period of development from which they emerge as warble flies.

Bloat can occur from warbles in the esophageal region interfering with belching. Grubs wandering in the area of the spine sometimes penetrate the spinal cord causing paralysis.

Treatment consists of applying pour on insecticides to the back of cattle in the fall. The systemic insecticides are absorbed through the skin and kill migrating larvae in the body tissues.

Warble grubs are controlled with a pour on treatment in the fall.

Lice

Lice are tiny creatures, visible to the naked eye, that infest the skin of livestock. Cattle lice have either biting or sucking mouth parts.

The entire life cycle is spent on the host. Eggs or "nits" laid on the hair, hatch and the young lice attach themselves to the skin, mature and lay eggs to complete the cycle. Noninfested animals become infested by close contact with infected ones. Eggs require 5 to 15 days to hatch, depending upon environmental conditions. The number of lice declines greatly in summer but some remain and start to increase with the advent of cool weather.

Biting lice cause much irritation, resulting in patchy hair loss through scratching and rubbing. Sucking lice cause anemia through loss of blood and unthriftiness. In severe cases, infestations may be so heavy as to appear as black, greasy patches, particularly around the head and neck.

Several effective insecticides are available for lice control. Consult your veterinarian or agricultural representative. No insecticides are effective against the eggs and so they must be reapplied after the eggs have hatched in badly infested animals.

Control depends upon prompt recognition and treatment of the infestation. Early treatment is recommended in order to control lice before build-up is high.

Mange

Mange is not a common disease of Manitoba cattle. Of the four different types, three are reportable, so any time mange is suspected it should be reported immediately to a veterinarian. It is caused by microscopic mites that live in or on the skin. The parasite spends its entire life cycle on the host. The disease is generally transmitted by close contact with infected animals but it can be spread by bedding and equipment, such as feeders.

Signs of the disease are most common around the neck and shoulders, back and root of the tail. Apart from hair loss, as seen with lice, affected areas of skin are covered with scabs. Removing the scabs will reveal red, raw areas. Mange mites cannot be seen with the naked eye.

Because of the possibility that one is dealing with a reportable disease, treatment should be left to veterinarians.

The prompt reporting of suspicious cases and avoidance of overcrowding should keep the disease in check.

More information on controlling insect pests on beef cattle is available in the Manitoba Agriculture publication, *Insect Control for Livestock*, available from your agricultural representative.

Controlling Feedlot Diseases

The performance and health of feedlot cattle in a large lot depends upon: the buyer, trucker, processing crew, pen checkers, feeders, treatment crew, veterinarian and manager. Each person in any one of these critical areas depends on everyone else doing their jobs properly for his own success. In a small lot the producer usually handles all these jobs himself.

In big or small lots a preventive herd management system should be developed with a veterinarian. The system should include:

- Accurate diagnosis of the cause of sickness and death
- Written treatment instructions for various diseases
- Records of diseases and their activities
- A disease prevention program

Such a plan will anticipate or detect problems in the early stages of development when treatment is easier and more effective.

Diagnosis: One or more diseases usually occur simultaneously in feedlot cattle. A correct diagnosis is a necessary first step in the control of feedlot diseases and is made by observing clinical signs and/or a post mortem examination.

Clinical Signs: Most cattlemen recognize the signs shown by sick animals well enough to make a rough diagnosis. They can usually identify the body system involved and begin the treatment program. However, a veterinarian should examine sick cattle from time to time to ensure that correct assumptions are being made.

Post-mortem Examination: This is the most important aspect of making a diagnosis in feedlots. The manager should arrange for a port-mortem on all dead cattle in the feedlot. There are several advantages to regular post-mortem examinations:

- It identifies the diseases which occur in the feedlot.
- It confirms and improves the clinical diagnosis.
- It helps to evaluate the effectiveness of the buyer, trucker, processing crew, pen checkers, treatment crew, feeders, managers and the veterinarian.
- It checks on the effectiveness of the treatment protocol and the disease prevention program that have been established.

Field post mortems at the feedlot are usually adequate to provide a diagnosis. It may be desirable to utilize provincial diagnostic laboratories for the post mortem or for special tests to confirm the field diagnosis or to provide other information.

Although there are many different methods of handling sick cattle, the most effective contains two key factors:

Hospital pens: Sick cattle should be moved from feeding pens to hospital pens. These should be protected from the weather, and consist of at least a covered shed. They should not be overcrowded, and should be set up so long hay can be fed with the starting ration.

Treatment: Each manager should ask the veterinarian to provide a written treatment regimen specifically designed for the feedlot. The treatment regimen should specify:

- the drugs and medication to be used for specific diseases which are likely to occur in the feedlot
- the dosage of the drugs to be used
- treatment intervals
- methods of administering the drugs
- necessary withdrawal times
- alternate drugs if the first medications do not appear to help

All sick cattle should be identified at the beginning of the treatment, preferably with plastic eartags.

Health Records

Detailed health and production records are necessary to plan an effective health management program. The following records should be kept in all feedlots:

Daily Sick and Death Records: Pen checkers record the date and the number of sick and/or dead animals by pen or lot number. From this record it is easy to spot where the health problems are occurring in the feedlot each day.

Daily Treatment Record: The treatment crew should record the temperature, degree of illness, weight, treatment given, disease symptoms and the outcome of the treatment (sent home, dead, or culled). This information is needed to decide if an animal should be culled, put on an alternate treatment, or explain why it died. Records also help evaluate the effectiveness of the treatment.

Of course there is no point in keeping records unless they are used. A monthly summary and analysis of the records can help the manager and the veterinarian to evaluate the treatment program, management and any other areas that contribute to the sickness and deaths. It will also help them to make adjustment to existing programs to suit changing circumstances in the lot.

Budgets & Their Use

This section outlines methods used to determine feeder costs and how budgets can be used by a producer to make management decisions. Whenever possible producers should substitute their own costs or estimated costs for the numbers in the budget. These budgets are only intended as a guide for producers when they analyze their own operations.

When working out these budgets, as a manager, you should always keep your specific objectives in mind. If making a decision that will only affect the operation of the feedlot for a short time – say one feeding cycle – then your income should at least cover your operating costs. In the long-run the feedlot should generate sufficient income to cover all costs, which are your operating, fixed and labor costs.

Uses of Budgets

Budgets can be used to assist a producer in analyzing his operation in the following ways:

- By calculating the potential profit in feeding cattle.
- To develop a cash flow so he can calculate how much cash (or loans) for the enterprise, are needed to operate the lot for a year or a quarter.
- By calculating the break-even price. This is the market (or stabilized) price needed to pay all costs listed in the budget
- By calculating the cost per kilogram or pound of gain in a feeder operation which is an important statistic for analyzing the success of the enterprise.

Budget #1 – Custom Beef Finishing

ASSUMPTIONS: Calves fed for 286 days with average daily gain (A.D.G.) of 2.1 lbs (0.95 kg). Calves start at 440 lbs (200 kg) and end at 1050 lbs (475 kg) for a total gain of 610 lbs (575 kg).

Cost Per Head	Example	Your Costs
1. Cost of Feeder	$383.63	
2. Trucking-In	5.50	
3. Feed Costs	208.65	
4. Drugs & Veterinary	8.89	
5. Bedding	8.58	
6. Yardage	51.48	
7. Milling Charge	20.92	
8. Trucking-Out	13.13	
9. Death Loss	10.84	
10. Selling Cost	46.82	
11. Interest	44.74	
Total Cost	$803.18	
Cost 100 lbs (45 kg) Gain (803.18 - 383.63) = 419.55 / 610	$ 68.78	
Breakeven (4% Shrink) 803.18 / 1008	$ 79.68	

Treatment: Each manager should ask the veterinarian to provide a written treatment regimen specifically designed for the feedlot. The treatment regimen should specify:

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11. Interest	44.74	
Total Cost	$803.18	
Cost 100 lbs (45 kg) Gain (803.18 - 383.63) = $\frac{419.55}{610}$	$ 68.78	
Breakeven (4% Shrink) $\frac{803.18}{1008}$	$ 79.68	

Records and experience are the best sources of information for budgets. The most easily understood data is that which is drawn from your own records. Other feedlots in the area are another important source of information, as are local suppliers and dealers, extension and university staff.

Explanatory Notes – Budget #1

Cost of Feeder – Use the market price you would have received had you sold the calf. The Manitoba Beef Commission price for July 1-December 31/83 Level III is 440 lbs x $92.11 = $405.28, less the 6% premium (Assuming a market price of $82.00/cwt for the calf) $405.28 - $21.65 = $383.63 or $87.19/cwt ($3.95/kg).

Trucking Costs – Feeders trucked into a custom feedlot either go by commercial transport or the producer's own truck. If you use your own truck determine the operating and fixed costs of the truck and use the total figure to calculate your hauling costs. In the example budget a commercial rate of $1.25/cwt for 100 km (62 miles) was assumed.

Feed Costs – Estimate the total amount of hay, grain, and supplements required per head. In the example budget the following was used:

Barley 1743 kg @ $95.00/tonne (3881 lbs @ $2.07/bu)	$165.60
Hay 745 kg @ $40.00/tonne (1645 lbs @ $36.00/ton)	$ 29.80
Salt & Minerals 25 kg @ $0.53/kg (55 lbs @ $0.24/lb)	$ 13.25
	$208.65

Drugs & Veterinary – Estimate the drug and veterinary costs for a normal herd health program. The budget assumes $8.89 per head.

Bedding – Bedding requirements vary a great deal in a feedlot depending on the weather. A rough guideline is 2 kg/head/day (4 lb). In the example we valued straw at $16.50/tonne ($15/ton).

Yardage – Estimates can be obtained from the manager of the feedlot. In the example budget yardage was assumed to be 18¢ per day for 286 days.

Milling Cost – This information can also be obtained from the commercial feeder. The cost is usually given as a cost/tonne of feed. Milling charges were estimated at $12/tonne for the 1743 kg of barley.

Death Loss – This varies greatly from one lot to the next. In the example budget a 2% death loss is assumed, on the average value of the feeder. The calculation for the death loss is as follows:

Calf price + Total Cost (Budget items 1-8)

$$\frac{\$383.63 + \$700.78}{2} \times 2\% = \$10.84$$

Selling Cost – If we assume the producer has chosen Level III on the Manitoba Beef Plan and the market price for slaughter cattle is $78/cwt ($1.72/kg) his selling cost is:

Marketing Charge (0.5% x $786.24)	$ 3.93
Cattlemans Association	1.00
Insurance	.62
Premium	41.27
	$46.82

Interest On Operating – This is calculated as a 10% interest charge on the cost of the calf, trucking, feed, drugs and veterinary, bedding, yardage and milling costs.

Example:

Feeder

$$\$383.63 \times 10\% \times \frac{286}{365} = \$30.06$$

Operating

$$\frac{\$374.81}{2} \times 10\% \times \frac{286}{365} = \$14.68$$

$44.74

Explanatory Notes – Budget #2

Cost of Feeder – Use the market price you would have received had you sold the calf (See Budget #1)

Feed Costs – Estimate the total amount of hay, grain and supplements required. (Same as Budget #1)

Drugs & Veterinary – Estimate the drug and veterinary costs for a normal herd health program. Budget assumes $8.89 per feeder, same as Budget #1.

Bedding – 2 kg/head/day (4 lb/head/day), straw is valued at $16.50/tonne ($15/ton), same as Budget #1.

Facility Costs – Operating costs of the facilities include the annual maintenance, cleaning and repairs to adequately house the feeders. In the example budget this cost was estimated at $500.

Machinery Costs – This includes all fuel, oil and repairs for machinery used in the feedlot operation. It was estimated that for a 100 head size operation, $500 would adequately cover machinery costs.

Trucking Costs – Depending on whether you use commercial haulers or your own vehicle the cost could differ substantially. If you use your own vehicle separate costs into operating and fixed. In the example budget a commercial rate of $1.25/cwt per head was assumed for an average distance of 100 km (62 miles)

Death Loss – In the example budget a 2% death loss was assumed, on the average value of the feeder as follows:

$$\frac{\$383.63 + \$632.88}{2} \times 2\% = \$10.17$$

Selling Cost – Same as Budget #1.

Example Budget #2 – Finishing Calves on Farm Feedlot

ASSUMPTIONS: Calves are fed for 286 days with average daily gain (A.D.G.) of 2.1 lbs (0.45 kg). Calves start at 440 lbs (200 kg) and end at 1050 lbs (475 kg) for total gain of 610 lbs (275 kg). Investment in feedlot, to handle approximately 100 head, would be $10,000 for facilities and $15,000 for machinery and equipment.

Operating Costs/Head	Example	Your Costs
1. Cost of Feeder	$383.63	
2. Feed Costs	208.65	
3. Drugs & Veterinary	8.89	
4. Bedding	8.58	
5. Facility Costs	5.00	
6. Machinery Costs	5.00	
7. Trucking	13.13	
8. Death Loss	10.17	
9. Selling Cost	46.82	
10. Interest Costs	42.06	
Total Operating Costs	$731.93	

Fixed Costs	Example	Your Costs
Depreciation		
Facilities	$ 6.00	
Machinery	13.50	
Investment		
Facilities	5.50	
Machinery	8.25	
Total Fixed Costs	$33.25	
Labor Costs		
5 hours/head @ $6.00/hour	$ 30.00	
TOTAL COSTS	$795.18	
Cost/100 lbs (45 kg) of Gain		
411.55 / 610	$ 67.47	
Breakeven (4% Shrink)		
792.82 / 1008	$ 78.89	

Interest On Operating – Is calculated on the costs of the calf, feed, drugs, bedding, facility and machinery costs.

Example:
Feeder
$383.63 \times 10\% \times \frac{286}{365} = \$30.06$

Operating
$\$306.24 \times 10\% \times \frac{286}{365} \times \frac{1}{2} = \$12.00$

$42.06

Fixed Costs

Depreciation – There are several methods of estimating yearly depreciation, the most common is the straight line method. The following formula was used in this budget.

$$\frac{\text{Original Value - Salvage Value}}{\text{Useful Life}}$$

(a) Facilities – Include items such as windbreak fences, feeders, water supply, gates, loading chute, headgate and squeeze, feed storage and others which may need to be considered.

Example:

$\$10{,}000 - \$1{,}000 = \$600/\text{year}$
15 years

$\$600 \div 100 \text{ head} = \$6.00/\text{head}$

(b) Machinery – Calculate the depreciation on all the machinery used in the feedlot.

Example:

$\$15{,}000 - \$1{,}500 = \$1{,}350/\text{year}$
10

$\$1{,}350.00 \div 100 \text{ head} = \$13.50/\text{head}$

Investment Cost – The interest component of total fixed costs is commonly calculated by the following formula:

$$\frac{\text{Original Cost} + \text{Salvage Value}}{2} \times \text{Interest Rate}$$

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Explanatory Notes – Budget #1

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Trucking Costs – Feeders trucked into a custom feedlot either go by commercial transport or the producer's own truck. If you use your own truck determine the operating and fixed costs of the truck and use the total figure to calculate your hauling costs. In the example budget a commercial rate of $1.25/cwt for 100 km (62 miles) was assumed.

Feed Costs – Estimate the total amount of hay, grain, and supplements required per head. In the example budget the following was used:

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Salt & Minerals 25 kg @ $0.53/kg (55 lbs @ $0.24/lb)	$ 13.25
	$208.65

Drugs & Veterinary – Estimate the drug and veterinary costs for a normal herd health program. The budget assumes $8.89 per head.

Bedding – Bedding requirements vary a great deal in a feedlot depending on the weather. A rough guideline is 2 kg/head/day (4 lb). In the example we valued straw at $16.50/tonne ($15/ton).

Yardage – Estimates can be obtained from the manager of the feedlot. In the example budget yardage was assumed to be 18¢ per day for 286 days.

Milling Cost – This information can also be obtained from the commercial feeder. The cost is usually given as a cost/tonne of feed. Milling charges were estimated at $12/tonne for the 1743 kg of barley.

Death Loss – This varies greatly from one lot to the next. In the example budget a 2% death loss is assumed, on the average value of the feeder. The calculation for the death loss is as follows:

Calf price + Total Cost (Budget items 1-8)

$$\frac{\$383.63 + \$700.78}{2} \times 2\% = \$10.84$$

Selling Cost – If we assume the producer has chosen Level III on the Manitoba Beef Plan and the market price for slaughter cattle is $78/cwt ($1.72/kg) his selling cost is:

Marketing Charge (0.5% x $786.24)	$ 3.93
Cattlemans Association	1.00
Insurance	.62
Premium	41.27
	$46.82

Interest On Operating – This is calculated as a 10% interest charge on the cost of the calf, trucking, feed, drugs and veterinary, bedding, yardage and milling costs.

Example:
Feeder

$$\$383.63 \times 10\% \times \frac{286}{365} = \$30.06$$

Operating

$$\frac{\$374.81}{2} \times 10\% \times \frac{286}{365} = \$14.68$$

$44.74

Explanatory Notes – Budget #2

Cost of Feeder – Use the market price you would have received had you sold the calf (See Budget #1)

Feed Costs – Estimate the total amount of hay, grain and supplements required. (Same as Budget #1)

Drugs & Veterinary – Estimate the drug and veterinary costs for a normal herd health program. Budget assumes $8.89 per feeder, same as Budget #1.

Bedding – 2 kg/head/day (4 lb/head/day), straw is valued at $16.50/tonne ($15/ton), same as Budget #1.

Facility Costs – Operating costs of the facilities include the annual maintenance, cleaning and repairs to adequately house the feeders. In the example budget this cost was estimated at $500.

Machinery Costs – This includes all fuel, oil and repairs for machinery used in the feedlot operation. It was estimated that for a 100 head size operation, $500 would adequately cover machinery costs.

Trucking Costs – Depending on whether you use commercial haulers or your own vehicle the cost could differ substantially. If you use your own vehicle separate costs into operating and fixed. In the example budget a commercial rate of $1.25/cwt per head was assumed for an average distance of 100 km (62 miles)

Death Loss – In the example budget a 2% death loss was assumed, on the average value of the feeder as follows:

$$\frac{\$383.63 + \$632.88}{2} \times 2\% = \$10.17$$

Selling Cost – Same as Budget #1.

Example Budget #2 – Finishing Calves on Farm Feedlot

ASSUMPTIONS: Calves are fed for 286 days with average daily gain (A.D.G.) of 2.1 lbs (0.45 kg). Calves start at 440 lbs (200 kg) and end at 1050 lbs (475 kg) for total gain of 610 lbs (275 kg). Investment in feedlot, to handle approximately 100 head, would be $10,000 for facilities and $15,000 for machinery and equipment.

Operating Costs/Head	Example	Your Costs
1. Cost of Feeder	$383.63	
2. Feed Costs	208.65	
3. Drugs & Veterinary	8.89	
4. Bedding	8.58	
5. Facility Costs	5.00	
6. Machinery Costs	5.00	
7. Trucking	13.13	
8. Death Loss	10.17	
9. Selling Cost	46.82	
10. Interest Costs	42.06	
Total Operating Costs	$731.93	

Fixed Costs	Example	Your Costs
Depreciation		
Facilities	$ 6.00	
Machinery	13.50	
Investment		
Facilities	5.50	
Machinery	8.25	
Total Fixed Costs	$33.25	
Labor Costs		
5 hours/head @ $6.00/hour	$ 30.00	
TOTAL COSTS	$795.18	
Cost/100 lbs (45 kg) of Gain		
$\frac{411.55}{610}$	$ 67.47	
Breakeven (4% Shrink)		
$\frac{792.82}{1008}$	$ 78.89	

Interest On Operating – Is calculated on the costs of the calf, feed, drugs, bedding, facility and machinery costs.

Example:
Feeder

$$383.63 \times 10\% \times \frac{286}{365} = \$30.06$$

Operating

$$\frac{\$306.24}{2} \times 10\% \times \frac{286}{365} = \$12.00$$

$42.06

Fixed Costs

Depreciation – There are several methods of estimating yearly depreciation, the most common is the straight line method. The following formula was used in this budget.

$$\frac{\text{Original Value - Salvage Value}}{\text{Useful Life}}$$

(a) Facilities – Include items such as windbreak fences, feeders, water supply, gates, loading chute, headgate and squeeze, feed storage and others which may need to be considered.

Example:

$$\frac{\$10,000 - \$1,000}{15 \text{ years}} = \$600/\text{year}$$

$600 ÷ 100 head = $6.00/head

(b) Machinery – Calculate the depreciation on all the machinery used in the feedlot.

Example:

$$\frac{\$15,000 - \$1,500}{10} = \$1,350/\text{year}$$

$1,350.00 ÷ 100 head = $13.50/head

Investment Cost – The interest component of total fixed costs is commonly calculated by the following formula:

$$\frac{\text{Original Cost} + \text{Salvage Value}}{2} \times \text{Interest Rate}$$

The investment costs for facilities and machinery in the example is as follows:

Facilities

$$\frac{\$10{,}000 + \$1{,}000}{2} \times 10\% = \$550$$

$\$550 \div 100$ head $= \$5.50$/head

Machinery

$$\frac{\$15{,}000 + \$1{,}500}{2} \times 10\% = \$825$$

$\$825 \div 100$ head $= \$8.25$/head

Labor Costs – Calculate the cost of labor by estimating the amount of time spent working on the feeder enterprise in relation to the total farm feedlot.

As a rough guide the approximate labor time spent per day on feeding, cleaning and repairs for 200 head of light feeders over the feeding period is about 4 hours.

4 hours/day x 286 days = 1144 hours
1144 hours ÷ 200 head = 5.72 hours
Therefore for a 100 head facility estimated labor was approximately 5 hours/head.

****Note:** If some equipment and facilities are used for other enterprises on the farm, estimate the percentage of usage for feedlot use and allocate accordingly.

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